

A. COVER PAGE

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hESC: No	Inventions/Patents: No

B. ACCOMPLISHMENTS

B.1. What are the major goals of the project?

In the modern workforce, the conditions of work are increasingly recognized as significant contributors to worker safety, health and wellbeing. Conditions of work encompass the physical environment and the organization of work (i.e., psychosocial factors, job design and demands, health and safety climate). More than 25 years ago, our team-initiated research testing integrated workplace policies and programs to improve the conditions of work and reduce workplace hazards and chronic disease risk. Our collective body of research has demonstrated improved worker safety and health outcomes for these system level approaches. Today, a common conceptual model—one that articulates the central role of conditions of work—undergirds the Harvard T.H. Chan School of Public Health Center for Work, Health & Well-being's overall approach and program of research. Improving adoption of system level approaches, rather than focusing on individual worker behaviors, requires that we shine a light on the shared impact of the conditions of work on worker health and safety outcomes. The maturing Total Worker Health® (TWH®) field has been informed by our Center's work leading to the Conceptual Model, the Center's definition of integrated approaches, and the Indicators of Integration.

Our Center's vision was focused on optimal worker safety and health and employer outcomes through improved conditions of work; our central objective is to expand the evidence on integrated approaches through etiologic and intervention effectiveness research studies and to build the practice base through translating and disseminating best practices, developing policy recommendations, and building the capacity of trained professionals and organizations. As a partnership between Harvard, the Dana-Farber Cancer Institute, Northeastern University, Partners HealthCare System, Inc., Boston University, Boston College, HealthPartners, Inc., the Massachusetts Department of Public Health, and a wide-range of regional and national employers and stakeholder groups, the Center aims to continue its leadership and expertise in the research and translation of TWH® integrated policies, programs, and practices. Our work addresses regional and national needs in two high priority, high risk industries: healthcare and construction.

Our Center's Overall Specific Aims, and those of the Planning and Evaluation and Outreach Cores, align with the priorities of the National Occupational Research Agenda (NORA) TWH® goals.

1. Research: Expand the scientific evidence base for protecting and promoting worker safety, health, and well-being through system-level approaches. In the proposed research, we will:
 - a. Examine pathways through which the work organization influences worker safety and health, using a large, longitudinal database of hospital health care workers;
 - b. Identify associations between integrated TWH® approaches and related enterprise outcomes, by linking survey and publicly available data on quality-of-care outcomes in nursing homes;
 - c. Test intervention effectiveness in a cluster-randomized trial of a TWH® intervention embedded across organizational structures in the construction industry; and
 - d. Determine innovative dissemination strategies in our Outreach Core.
2. Practice: Develop, disseminate, and evaluate the public health impact of resources and best practices to improve the conditions of work and the safety and health of workers. Working with key partners, we will synthesize key findings and provide guidelines and recommendations to implement changes in work organizational factors to achieve optimal worker well-being.
3. Policy: Determine the policy implications of our past and current research and make recommendations on workplace and public policies. We will review our research findings with a Policy Working Group to determine their implications for policy.
4. Capacity-building: Build the capacity of enterprises, professionals, and researchers to implement evidence-based practices for TWH® in industry and to expand the scientific field. Through our leadership

model, training, and outreach activities, and in partnership with other centers, we will train the next generation of TWH® researchers and build capacity for enterprises to implement TWH®.

The outcomes of the Center's collective work included an improved understanding of the influences of the conditions of work on worker safety and health as well as on enterprise outcomes; evidence-based integrated interventions to improve these work factors and the health and safety of workers; innovative knowledge transfer and exchange strategies; and an expanded workforce trained in TWH® approaches. These results are expected to have a positive impact because they are likely to result in increased uptake of TWH® policies, programs, and practices, resulting in improvements in the organization of work, and ultimately, protection and promotion of worker health and safety.

B.2. What did you accomplish under these goals?

During the funding cycle from 2016 to 2021 the Center made significant contributions to shaping the emerging field of TWH®. Our work funded directly by the Center resulted in 46 publications, 100 conference presentations; and 25 seminars/webinars/panel presentations. (See details in C.1 Publications, conference papers, and presentations. These numbers do not include additional publications reflecting the work of our affiliated studies.)

Our accomplishments summarized below demonstrate that the Center has successfully cultivated and expanded mechanisms that allowed it to serve as the hub for fostering a shared vision among Center investigators and facilitating communication across research projects. The Center used planning processes and procedures to foster priority setting and strategic planning and facilitate transdisciplinary input. The Center's Internal Steering Committee (ISC) and External Advisory Board (EAB) provided scientific guidance and support to the Center. The Center used its established and well-functioning evaluation structure to collect ongoing feedback and facilitate tracking of measurable results. We also instituted a monthly Works-in-Progress meeting to enable early feedback and problem-solving on our evolving work. These centralized functions were coordinated by the Evaluation and Planning (E&P) Core, which also facilitated our interactions with NIOSH, other NIOSH-supported TWH® Centers, organizations, and other stakeholders.

A summary listing of our major Center level accomplishments include:

- Developed and applied a guiding conceptual model focusing on the central role of conditions of work
- Established a database of approximately 22,000 hospital workers that has enabled us to identify working conditions associated with workers' health, safety, and well-being
- Expanded the database by increasing access to insurance datasets
- Developed and tested TWH® interventions in the construction industry including unions, general contractors, and subcontractor-based programs, reaching over 12 employers and 600 workers
- Developed, published, tested, and disseminated best practice guidelines for TWH® (downloaded over 1500 times), resulting in our Capacity Building Suite for health services providers and companies
- Developed and validated Worksite Integrated Safety and Health (WISH) Assessment (downloaded over 500 times)
- Expanded and grew the TWH® workforce of both research and practice professionals
- Surveyed 570 long-term care facilities in three states to determine the extent of implementation of TWH® approaches

Since its inception, our Center has played a leadership role in the development of the TWH® approaches. During this funding cycle, our Center advanced the field as follows:

Created the defining conceptual model for TWH®, included in NIOSH's recent volume on Total Worker Health®, which places a central focus on the conditions of work as social determinants of safety, health, and well-being:

First published in *Preventive Medicine* in 2016, this model guides our research directions and plans for research-to-practice (r2p) efforts. The Center's leadership team recently expanded this conceptual model to guide planning for changes related to the future of work, by situating the enterprise and its conditions of work within the context of broader socio-political-economic environments and consequent trends in employment and labor force patterns.

Conducted TWH® social epidemiology research that expanded the evidence base for the central role of working conditions as critical determinants of worker safety, health, and well-being:

The *Boston Hospital Worker Health Study*, initiated at the start of the Center's funding in 2007, is a collaboration with Mass General Brigham (previously Partners Healthcare). Together, we have constructed a model employer database that includes human resources data, injury incidence, worker compensation data, and healthcare utilization data matched with employee surveys. We have documented the relationships of an array of working conditions to workers' health, safety, and well-being, and to employer outcomes, including healthcare costs, and have used these findings to inform policies. These findings have informed policies and practices in the Mass General Brigham health care system, the largest employer in Massachusetts. We build on the foundation provided by this database to identify sources of disparities in worker safety, health, and well-being, and to expand understanding of the impact of policies on worker safety, health, and well-being. As a consequence of this collaboration, Mass General Brigham has increasingly adopted a systems-based approach to health and safety, as illustrated by a hospital-wide safe patient handling intervention that also resulted in reductions in worker injuries, and in the health system's response to the COVID-19 pandemic.

Measured integrated TWH® approaches through development and testing of measures that advance the TWH® field:

We developed and validated the Workplace Integrated Safety and Health (WISH) Assessment to measure workplace policies, programs, and practices that focus on working conditions and organizational facilitators of worker safety, health, and well-being. The tool can be used by employers and researchers to assess the extent of implementation of an integrated approach. This validated measure assesses six core constructs central to best practices for protecting and promoting worker safety, health, and well-being: (a) leadership commitment; (b) participation; (c) policies, programs, and practices that foster supportive working conditions; (d) comprehensive and collaborative strategies; (e) adherence to federal and state regulations and ethical norms; and (f) data-driven change. Available on our website since 2018, the WISH tool has been downloaded more than 500 times.

In an affiliated study, Center investigators recently developed and validated the Thriving from Work Questionnaire, which will be used across the research projects in our next cycle. This instrument was developed to have applications across research, policy, and practice including: (a) as an outcome measure of workers' thriving for research purposes, used to identify the extent to whether workers are thriving (or not) in intervention, surveillance, and etiologic research; (b) as a one-time survey instrument for use across a working population or for periodic surveillance (repeated surveys) across a diversely employed worker population or within a single employing organization; and (c) as an organizational diagnostic tool (instrument to identify priority areas for selecting interventions to improve worker well-being and to monitor their effectiveness). Further research using this measure has been incorporated into our Center renewal.

Developed and tested a TWH® intervention model designed to improve conditions of work:

Our best practice model has been tested in intervention studies in construction with 12 employers including over 600 workers in small- and medium-size businesses, and in the healthcare sector. Leveraging other sources of funding, we have further tested this model among low-wage food service workers, and with transportation workers in Chile.

Disseminated and implemented best practices for TWH® interventions focusing on improving conditions of work:

Our Implementation Guidelines, developed in the prior funding cycle, defined our TWH® approach to improving conditions of work. Available on the Center's website, the Guidelines have been downloaded more than 1500 times. The Guidelines are part of our Capacity Building Suite, which also includes guidelines for training and technical assistance. We have demonstrated that this Capacity Building Suite can be used effectively by third-party providers to guide employers in the use of TWH® approaches. Our close collaborations with employers, labor unions, and other stakeholders place our work solidly "in the trenches," ensuring that our methods are relevant to employers and workers. In addition, our Center has placed increasing priority on workplace and public policies as a critical facilitator of change, as evidenced by our publications, presentations at the TWH® international meetings.

Demonstrated a long-term commitment to mentoring and training:

Through our leadership model, training, and outreach activities, and in partnership with other centers, we continued to serve as a major resource for mentoring, training and supporting postdoctoral fellows, students and others through existing and new research and training opportunities to train the next generation of TWH® researchers and build capacity for enterprises to implement TWH®. In the last five years, the Center contributed to the development of four postdoctoral fellows, 11 doctoral students, and five masters or undergraduate students (see below in B.4 for full list of trainees).

Impact of COVID-19 on meeting our Center's aims:

We would like to note that we experienced several delays in meeting our aims due to COVID-19 restrictions impacting both the Intervention Effectiveness Study and the Outreach Core. On the Intervention Effectiveness Study, we successfully recruited 7 out of 14 study companies by March of 2020, mid-way through the Intervention Effectiveness trial. However, the onset of the COVID-19 pandemic created significant barriers to the completion of further study recruitment and implementation. Because of COVID-19 safety protocols, research investigators and other staff were not allowed to complete planned on-site and in-person intervention activities. We were also unable to conduct further in-person recruitment meetings with potential companies due to their need to focus on establishing and implementing their companies' COVID safety protocols. We requested and were granted a carryforward to complete several activities related to the development and implementation of program guides to build the internal capacity of companies to complete the intervention program. While the trial was not successfully completed due to the pandemic, the lessons learned and the enthusiasm with our partners indicates there is a need for translating the program for implementation by companies on their own. This activity fits squarely with the project's specific aims by making recommendations and creating products for the industry to implement a Total Worker Health approach. The activities will include: 1) drafting a set of trainings and guides building from our intervention manual, 2) testing them with two partners at one of their major sites, 3) refining the materials, and 4) disseminating these materials and training with other partners and stakeholders locally and globally.

We collaborated with HealthPartners and three of their small- to medium-size business clients on a pilot program to address the Outreach Core implementation aim focused on determining the feasibility and impact of developing and using the Implementation Manual Capacity Building Suite with a vendor (HealthPartners). We were able to successfully develop and complete Capacity Building Technical Assistance trainings with a team of HealthPartners occupational medicine residents and physicians and health and well-being consultants on the use of the manual with their clients through the Action Planning phase. HealthPartners and the pilot client companies were able to complete the pilot though the Action Planning phase; however, as a consequence of the COVID-19 shut-down in March 2020, training and completion of the implementation phase were interrupted. Participating companies faced significant staffing layoffs and interruptions in their work. We were therefore not able to complete testing and dissemination of the Capacity Building Suite with HealthPartners. During our carryforward period, we will expand the HealthPartners pilot to examine the implementation phase after the action planning has been completed. Activities will include: 1) develop resources for the implementation phase to complete the Capacity Building Suite, 2) examine implementation projects from our Center and affiliated Centers to develop and submit a manuscript describing the barriers to and facilitators of successful implementation, and 3) use the Capacity Building Suite with other partners to

expand its reach. We will also update our website platform and server, create an opioid related resource page, and work with the Intervention Effectiveness study team to develop resources for the ARM project.

Accomplishments towards aims:

Aim 1: Research: Expand the scientific evidence base for protecting and promoting worker safety, health, and well-being through system-level approaches.

The Center's three research projects advanced our understanding of the roles of the conditions of work in worker safety, health, and well-being and in enterprise outcomes. Critically, these projects examined the feasibility and efficacy of integrated policies, programs, and practices to reduce these risks. Our research accomplishments across our three studies and affiliated studies are as follows:

Examining Pathways: The Boston Hospital Workers Health Study (Sabbath, Lead): Established in the Center's first funding cycle, the *BHWHS* built a database including 22,000 direct patient-care workers employed at Brigham and Women's and Massachusetts General Hospitals (now both part of the Mass General Brigham healthcare system, formerly Partners Healthcare) from 2009 to the present, drawing data from five different datasets plus a repeated self-report survey. Each year, we updated the database to include workers hired since the last update, while retaining employees in the database who have left their jobs at Mass General Brigham. We made individual-level linkages between periodic surveys and the administrative datasets, allowing us to test associations between workers' perceptions of the physical, psychosocial, organizational, and policy work environment and a variety of outcomes. Since the project's inception in 2007, we have contributed more than 40 peer-reviewed manuscripts to the literature, most of which assess the relationship between working conditions and worker safety, health, and well-being. Based on the Center's conceptual model that is shared across projects, the *BHWHS* has focused on the conditions of work—rather than individual worker attributes or behavior—as primary determinants of health. This social epidemiological study has demonstrated the central role of conditions of work, such as flexibility, demands and control, break practices, bullying at work, and discriminatory practices, for a range of outcomes, including worker injuries, mental health diagnoses and expenditures, and preventive health care utilization.

Intervention Effectiveness: All the Right Moves for Subcontractors (Dennerlein, Lead)

We developed and tested a TWH[®] intervention for subcontractors and self-performing contractors in the construction industry. Our previous research, implementing interventions with trade unions and general contractors, indicated a need for evidence-based interventions for subcontracting companies that focuses on the conditions of work. Starting with the Center's Implementation Guidelines, the development of the intervention was based on a theory-driven approach supplemented by formative research through key stakeholder interviews and focus groups, an iterative vetting process with stakeholders, and a pilot study with one subcontracting commercial construction company on two worksites/crews. This resulted in a company-based communication infrastructure with continual improvement and a participatory intervention design consisting of a needs assessment and report, committee-led prioritization, action planning and implementation, and a worker communication/feedback cycle. We recruited seven companies to test the intervention prior to the COVID-19 shutdown of in-person research. In the three companies where we successfully implemented the completed program, we observed improvements in safety and health climate, improved worker participation, and higher TWH[®] implementation based on WISH Assessment scores, compared to the companies without successful full implementation. With the COVID-19 shutdown, we converted our intervention program to be implemented and sustained by company personnel, with a focus on COVID-19-related health and safety issues. We began implementing the sustainable COVID-19-focused program with construction work crews of a local utility company and subcontractors on a worksite managed by a large national general contractor. We developed a set of training materials for the industry and research and trade publications on the findings of this research.

Enterprise Outcomes (Williams, Lead):

This study was developed in response to the exceptionally high risk of chronic disease and occupational injury among the 3.5 million workers in the U.S. nursing home industry and in recognition of the significant knowledge gap regarding the degree to which the nursing home industry's existing programs, policies, and practices align with TWH®. Our central hypothesis was that nursing homes whose programs, policies, and practices align more closely with TWH®, as measured by our WISH Assessment, would have better outcomes with respect to occupational injury and quality of patient care compared to worksites less aligned with TWH® approaches. We surveyed 570 nursing homes in California, Massachusetts, and Ohio using the WISH Assessment and assessments of the strength and types of their occupational health and wellness programs. We merged these survey data with data on each facility's occupational injury rates, available through a partnership with Workers Compensation bureaus, and with data on quality of care (assessed as patient outcomes on key medical conditions) and nursing homes' operational, organizational, and patient characteristics, obtained from federally mandated administrative databases. Using this survey sample, we validated the WISH Assessment by examining functional items for each of the six scales, reliability, and dimensionality of the latent constructs. Five of the six constructs were demonstrated to be unidimensional. Overall, measure and construct reliability ranged from acceptable to good. We also used the data to abbreviate the tool. Ongoing analyses are evaluating (a) the relationship between TWH® as measured by the WISH Assessment and the numbers of COVID-19 cases among residents and staff at nursing homes; (b) the relationship of TWH® implementation to injuries; and (c) the relationships between TWH® implementation and nursing-sensitive quality indicators. This study was initially led by Dr. Cassandra Okechukwu, who left the Harvard Chan School for a non-academic position prior to the study start-up. The Center leadership worked with Dr. Okechukwu to ensure a smooth transition of the leadership of this study. Dr. Jessica Williams, Project Lead for this study, was previously a postdoctoral fellow within the Center and is now Associate Professor of Health Policy and Administration at Penn State College of Health and Human Development. We continue to collaborate with Dr. Williams on the analyses and publications described above.

Affiliated Studies: To extend our Center's reach and impact, we built on affiliated studies aligned with the Center's mission

Although not supported by the NIOSH TWH® Center of Excellence funding, our affiliated studies expanded the scope of the Center's work and allowed Center investigators to draw on findings from related research. We would like to note that two of our research projects in our current cycle of funding (2021 – 2026) specifically built on the work of our affiliated studies laying the groundwork for our logical next steps.

The full listing of our Affiliated Studies is as follows:

Project Name	Principal Investigator(s)	Aims	Funder/Dates
Organizational Approaches to TWH for Low Income Workers	Glorian Sorensen, PhD	Identify factors in the work organization expected to be associated with MSD risk, work-related well-being and job satisfaction among low-wage food service workers which can be feasibly modified through changes in management practices. Determine the feasibility and potential efficacy of	NIOSH 8/1/2016 – 7/31/2021

		an integrated TWH intervention designed to improve the work organization and environment, workers' MSD symptoms, ergonomic practices and work-related well-being and job satisfaction.	
Improving Mental Health and Wellbeing in Construction Workers: Understanding the Role of Work and the Conditions of Work	Jack Dennerlein, PhD	<p>Determine what workers think about and what they understand about their mental health and wellbeing within the context of the work environment including both factors that contribute to poor mental health and those that support and promote mental health and well-being</p> <p>Examining pathways within the Center's Conceptual Model by testing associations between work-related factors and psychological distress among commercial construction workers.</p>	<p>Northeastern University Internal Funding</p> <p>9/1/2016 – 12/31/2017</p>
Integrated Approaches for Driver and Crew Health and Safety in a National Transportation Company (In collaboration with Mutual de Seguridad, CChC, Chile)	Jack Dennerlein, PhD Glorian Sorensen, PhD Susan Peters, PhD	<p>Assess relationships between specific conditions of work, and driver and crew safety and health.</p> <p>Develop and implement a TWH intervention that targets working conditions identified as priorities by workers and management.</p>	<p>La Superintendencia de Seguridad Social (SUSESO), Chile</p> <p>5/8/2018 – 5/8/2021</p>

Exploring the Conditions of Work and Contextual Mechanisms that Influence Return to Work (RTW) Following Work-related Injury in a Cohort of Patient Care Workers (PCWs) in Massachusetts	Susan Peters, PhD	Examine the relationships between the conditions of work, individual worker factors and other potential mechanisms in the RTW process that influence RTW outcomes following a work-related injury in PCWs by using secondary data collected in the Boston Hospital Workers' Health Study (BHWHS); Explore the RTW experiences of both PCWs who have suffered a work-related injury and key RTW stakeholders through qualitative inquiry	Harvard Education and Research Center, Harvard T.H. Chan School of Public Health 10/1/2018 – 6/30/2019
Investigating Facilitators and Barriers to the Implementation of Policies, Programs, and Practices Supportive of Positive Working Conditions for Patient Care Workers in Hospital Settings	Maria Andree Lopez Gomez, PhD	Identify unit level facilitators and barriers to the implementation of hospital policies related to organizational and psychosocial working conditions of patient-care workers in acute-care settings.	Harvard Education and Research Center, Harvard T.H. Chan School of Public Health 10/1/2018 – 6/30/2019
Employer-based Approaches for Targeting the Opioid Crisis in the Construction Industry	Jack Dennerlein, PhD	Identify and examine the contextual factors influencing the delivery and evaluation of a planned employer-based program in construction. Generate new knowledge about pain and pain management for workers, a new scientific instrument to help evaluate organizational climate surrounding worker pain and pain management, and the groundwork for a new intervention model for opioid addiction prevention within the community.	Northeastern University Internal Funding 7/1/2019 – 8/31/2020
Development and Validation of a Measure	Gregory Wagner, MD Susan Peters, PhD	Development of a scale and conduct	Lee Kum Sheung Center for Health and

of Work-related Wellbeing in the US Workforce		<p>psychometric testing on its properties.</p> <p>Establish the dimensions and items to be contained in the scale as well as scoring for the Work-related Wellbeing Scale</p> <p>Examine construct and criterion validity, as well as reliability of the Work-related Wellbeing Scale; explore how work-related wellbeing in sub-populations of workers (e.g., industry, age, gender, race).</p>	<p>Happiness, Harvard T.H. Chan School of Public Health, Innovations in Positive Health Pilot Program</p> <p>8/15/2019 – 8/14/21</p>
Work-related Wellbeing in the New England Workforce	Susan Peters, PhD	<p>Explore and define work-related wellbeing with a specific focus on a number of key areas including the ‘future of work’ and different work arrangements (non-standard and standard work arrangements), social disparities and application to different industries and occupational roles and to discern the constructs that constitute ‘work-related wellbeing’.</p> <p>Conduct formative research including interviews with experts, and cognitive testing to identify items to be used in the psychometric evaluation to create a measure of ‘work-related wellbeing’</p>	<p>Harvard Education and Research Center, Harvard T.H. Chan School of Public Health</p> <p>12/23/2019 – 6/30/20</p>
Cancer Prevention Among Firefighters: Postdoctoral Research Fellowship	Glorian Sorensen, PhD	Application of a Total Worker Health® approach to research opportunities to examine combined risks associated with physical, psychosocial and organizational hazards in the firefighters’ work environment.	Pan Mass Challenge Boston Fire Funds raised through Team Boston Firefighter participation in the Dana-Farber Cancer Institute’s Pan Mass Challenge and Last Call Foundation

<p>Intervention development and launch of a cluster-randomized trial in fulfillment centers to be evaluated in the <i>Fulfillment Center Intervention Study</i> as part of our 2021-2026 renewal</p>	<p>Dr. Erin Kelly, PhD Dr. Hazhir Rahmandad, PhD</p>	<p>Identify priority working conditions of concern to workers through qualitative work to inform intervention development.</p> <p>Develop and test intervention approach in a developmental pilot in one fulfillment center.</p> <p>Conduct baseline and 6-month surveys in 21 fulfillment centers.</p>	<p>9/1/2020 – 8/31/22</p> <p>Washington Center for Equitable Growth, the MIT Sloan School of Management's Good Companies, Good Jobs Initiative, the MIT Sloan Health Systems Innovation Initiative, in collaboration with the e-commerce division of a national retail firm.</p> <p>3/2019 – 9/2021</p>
<p>Substance Use Provider Occupational Wellbeing Study: Identifying Sources of Stress and Resilience Among Frontline Substance Use Workers (SUP's) in Massachusetts</p>	<p>Beth Stelson, (Harvard Chan School doctoral student mentored by Drs. Sorensen and Sabbath)</p>	<p>Identify challenging working conditions in residential addiction treatment facilities in MA from the perspectives of SUPs and organizational leaders, including how the COVID-19 pandemic has exacerbated workplace challenges.</p> <p>Ascertain how these identified challenges as well as supports affect SUP psychological and physical safety, health, and general wellbeing at work and at home.</p> <p>Determine how identified challenges and supports affect organizational dynamics and workforce turnover at the treatment facilities and SUPs' intentions to leave the field of addiction services.</p> <p>Explore how workplace challenges and supports, organizational dynamics, and SUP turnover are associated with client outcomes</p>	<p>Harvard Education and Research Center, Harvard T.H. Chan School of Public Health</p> <p>10/2020 – 6/2021</p>

Aim #2. Practice: Develop, disseminate, and evaluate the public health impact of resources and best practices to improve the conditions of work and the safety and health of workers. Working with key partners, we will synthesize key findings and provide guidelines and recommendations to implement changes in work organizational factors to achieve optimal worker well-being.

The Center has a solid track record for translating evidence-based interventions into practice in concert with the NIOSH Research-to-Practice (r2p) Initiative and in collaboration with the TWH® Program. Our major accomplishments include building a successful partnership model with health services providers; developing, testing, and implementing a Capacity Building Suite; developing workplace COVID-19 safety resources; providing policy guidance and policy research recommendations for the Center; and maintaining and expanding our outstanding training record. Through our well-established collaboration with HealthPartners, a major U.S. non-profit integrated health system partner based in Bloomington, Minnesota, we tested our Capacity Building Suite with three of their client companies, providing a foundation for dissemination. The Outreach Core also led translation of our research findings for application to policy and practice. We synthesized promising practices from intervention and implementation studies from across the Center. In response to the COVID-19 pandemic, Center investigators created several public-facing resources through online workshops and webinars; wrote op-eds and served as content experts supporting news media articles about the pandemic and workers' safety, health, and well-being; and applied our Implementation Guidelines to recommendations for addressing working conditions in the face of the COVID-19 pandemic. We created new open-source evidence-based knowledge and implementation products, including our Implementation Guidelines. To support use of these guidelines, we developed and tested our Capacity Building Suite for health services providers.

Aim #3: Policy: Determine the policy implications of our past and current research and make recommendations on workplace and public policies. We will review our research findings with a Policy Working Group to determine their implications for policy.

Workplace-specific policies and public policies, regulations, and guidelines are key vehicles for translating research findings to motivate improvement in working conditions. The Center initiated its TWH policy work by establishing the Center's Policy Working Group (PWG) and related efforts. The PWG convened experienced thought leaders in workplace and public policy development, communication, and implementation. The PWG guides the Center's emphasis on policy and led to several key accomplishments. We produced a comprehensive review of 57 Center manuscripts published between 2011 and 2019, with a synthesis of their policy implications and recommendations (Gómez MAL., Sparer-Fine E, Sorensen G., Wagner G. Literature Review of Policy Implications from Findings of the Center for Work, Health, and Well-being. *Journal of Occupational and Environmental Medicine*. 2019;61(11):868-876); created an infrastructure for data synthesis and manuscript planning that ensured future Center manuscripts included discussion of policy implications and relevant topics; created feedback loops between the PWG and Research Core to set priorities for future research; and led dissemination and communication efforts surrounding policy implications of TWH research at the Second International Symposium to Advance TWH in 2018 in Bethesda, MD. The PWG also stimulated consideration of policy and policy-relevant research through the Center's strategic planning process.

Aim #4: Capacity-building: Build the capacity of enterprises, professionals, and researchers to implement evidence-based practices for TWH® in industry and to expand the scientific field.

Senior Center faculty including Drs. Glorian Sorensen and Greg Wagner mentored students at many stages of their education including postdocs Drs. Emily Sparer, Susan Peters, Maria Andree Lopez Gomez, and Winnie Chin. Dr. Sparer funded through the NCI-funded cancer prevention training program, submitted a K01 application to NIOSH to build on her pilot work with the Boston Fire Department. Dr. Sparer is currently Director, Occupational Health Surveillance Program at the Massachusetts Department of Public Health. Dr. Peters was funded by the Liberty-Mutual Post-doctoral training program and is currently a Research Scientist at HSPH and a Project PI on the "Thriving Workers, Thriving Workplaces Study" in our new cycle of funding (2021 – 2026). Dr. Maria Andree Lopez Gomez, a Yerby Fellowship recipient contributed to the work of Examining Pathways database, Enterprise Outcome as well as the Policy Working Group and is currently a Postdoctoral Research Fellow in the Centre for Demographic Studies at the Autonomous University of Barcelona, Spain. Dr. Winnie Chin, is our post-doc on a new two-year fellowship (September

2020 – August 2022) which is committed to building research expertise focused on cancer prevention and occupational health for firefighters with funding from the Dana-Farber Cancer Institute.

The Center also hosted two Fulbright Fellows: Marta Pilotto, LLM, from the University of Trento, Italy; and Yasmine Bezzaz, MSc Management, a doctoral student at Mohammed V University, Morocco who were also mentored by Drs. Sorensen and Wagner to add Total Worker Health® principles into their dissertation work.

See below in Section B.4 Training and Professional Development for additional details on their contributions as well as a full listing of our mentees.

The Center also provided multiple presentations, webinars, seminars and other training and educational opportunities including our annual course offered by the Harvard T.H. Chan School of Public Health Executive Continuing Professional Education, co-sponsored seminars with the Harvard T.H. Chan School of Public Health Education and Research Center, and inclusion of TWH® principles in coursework at HSPH, Northeastern, and Boston University. Please see C.1 Publications, conference papers, and presentations for a complete listing.

B.3. Competitive Revisions/Administrative Supplements

Not applicable

B.4. What opportunities for training and professional development did the project provide?

The Center served as major resource for mentoring, training, and supporting junior faculty, post-doctoral fellows, students and others through existing and new research and training opportunities. Mentored research opportunities included participation in study design, including survey design and intervention development; data analysis; preparation of manuscripts; presentation at conferences; teaching opportunities; and leadership of pilot research initiatives. From 2016 - 2021, the Center contributed to the development of four postdoctoral fellows, 11 doctoral students as well as five masters or undergraduate students as follows:

Harvard T.H. Chan School of Public Health Center for Work, Health, & Well-being Current & Former Trainees (2016-2021)			
Name	Project Focus	Research Project or Outputs Related to Center Projects during the Training Period	Current Position
Post-Docs from Current Cycle 2016-2021			
Winnie Chin (post-doc) 2020-present	Affiliated project: Cancer Prevention among Firefighters	Pilot project titled "Identifying factors that influence firefighters' exposure reduction practices and well-being" funded by PMC Team Boston Fire, the Last Call Foundation, and the Harvard T.H.Chan School of Public Health Education and Research Center	Postdoctoral Research Fellow PMC Team Boston Fire Fellowship at Dana-Farber Cancer Institute
Maria Andree Lopez Gomez (post-doc, HSPH Yerby Fellow) 2017-2019	Boston Hospital Workers Health Study (BHWHS) Enterprise Outcomes Outreach Core	Organizational and Psychosocial Working Conditions and Their Relationship With Mental Health Outcomes In Patient-Care Workers. Gómez MAL, Sabbath E, Boden L, Williams JAR, Hopcia K, Hashimoto D, Sorensen G. <i>Journal of Occupational and Environmental Medicine</i> (2019) Dec 61:12. Gómez MAL., Sparer-Fine E, Sorensen G., Wagner G. Literature Review of Policy Implications from Findings of the Center for Work, Health, and Well-being. <i>Journal of Occupational and Environmental Medicine</i> . 2019;61(11):868-876.	Postdoctoral Fellow, Centre for Demographic Studies at the Autonomous University of Barcelona, Barcelona, Spain

Susan Peters (post-doc) 2016-2019	BHWHS Intervention Effectiveness (Construction) Outreach (Capacity Building Suite) Affiliated Projects	<p>A Cluster Randomized Controlled Trial of a Total Worker Health® Intervention on Commercial Construction Sites. Peters SE, Grant MP, Rodgers J, Manjourides J, Okechukwu CA, Dennerlein JT. <i>International Journal of Environmental Research and Public Health</i>. 2018; 15(11):2354.</p> <p>Designing a Participatory Total Worker Health® Organizational Intervention for Commercial Construction Subcontractors to Improve Worker Safety, Health, and Well-Being: The “ARM for Subs” Trial. Peters SE, Trieu HD, Manjourides J, Katz JN and Dennerlein JT. <i>Int. J. Environ. Res. Public Health</i> 2020, 17, 5093</p> <p>Thriving from Work: Conceptualization and Measurement Peters SE, Sorensen G, Katz JN, Gundersen DA, Wagner GR.. <i>International Journal of Environmental Research and Public Health</i>. 2021 Jan;18(13):7196. doi.org/10.3390/ijerph18137196</p>	<p>Research Scientist, Center for Community-Based Research, Harvard T.H. Chan School of Public Health</p> <p>Project Lead for <i>Thriving Workers, Thriving Workplaces Study</i>, Harvard Chan School of Public Health Center for Work, Health, & Well-being (2021-2026)</p> <p>Harvard T.H. Chan School of Public Health Lee Kum Sheung Center for Health and Happiness, Innovations in Positive Health Pilot Program</p>
Emily Sparer-Fine (post-doc and prior pre-doc) 2015-2018	BHWHS, Intervention Effectiveness (Construction) Outreach (Policy Working Group)	<p>Sparer EH, Herrick RH, Catalano P, Dennerlein JT. Safety Climate Improved through a Safety Communication and Recognition Program for Construction: A Mixed Methods Study. <i>Scandinavian Journal of Work, Environment, and Health</i>. 2016 Jul 1;42(4):329-37 PMID: PMC4948113 .</p> <p>Sparer EH, Boden LI, Sorensen G, Dennerlein JT, Stoddard A, Wagner GR, Nagler EM, Hashimoto DM, Hopcia K, Sabbath EL. The relationship between organizational policies and practices and work limitations among hospital patient care workers. <i>Am J Ind Med</i>. 2018 May 29. doi: 10.1002/ajim.22864. PMID: PMC6265111.</p>	Director, Occupational Health Surveillance Program, Massachusetts Department of Public Health

Doctoral Students (2016-2021)

Yasmine Bezzaz (Fulbright Fellow, pre-doc, visiting student) 2019-2020	Affiliated projects	Adding Total Worker Health® principles into her dissertation on the relationship between High Performance Work Practices, emotional exhaustion and disengagement from work.	Doctoral student at the Faculty of Legal, Economic and Social Sciences, Rabat-Agdal Mohammed V University, Morocco
Thomas Carpenito (pre-doc, Northeastern) 2020 - present	Intervention Effectiveness (Construction Workers)	In progress: Using data from our construction worksite projects including the Intervention Effectiveness in dissertation	Doctoral Candidate, Program in Population Health, Northeastern University
Alex Kowalski (pre-doc, MIT Sloan School of Management)	Fulfillment Center Intervention Study	“The turnover costs of long hours: An examination of work schedules inside warehousing.” Presented at: LERA@ASSA	Doctoral Candidate, MIT Sloan School of Management

2019-present		Annual Meeting, virtual, Jan. 2020. LERA Annual Meeting, virtual, June 2020. “Can the risk be mitigated? Examining variations in work scheduling practices in volatile demand environments and their workforce implications.” Presented at: People and Organizations, Philadelphia, Pennsylvania, Sept. 2019. LERA Annual Meeting, Cleveland, Ohio, June 2019.	Institute for Work and Employment Research
Pamela Linzer (pre-doc, Boston College) 2015-2019	BHWHS	Dissertation Title: Age Differences in Occupational Health in a 2014 Cohort of Hospital Nurses	Associate Chief Nursing Officer for Inpatient Nursing, Nursing Informatics, and Nursing Resources Winchester Hospital (Massachusetts)
Samantha Meeker (pre-doc, Northeastern) 2020- present	Affiliated projects: Public Safety; Vicarious Trauma	In progress: Determining the prevalence of vicarious trauma in high exposure groups, first responders and health care workers through secondary analysis of national longitudinal cohort.	Doctoral Candidate, Program in Population Health, Northeastern University
Dale Maglalang (pre-doc, Boston College) 2017-2020	BHWHS	Maglalang, D. D., Katigbak, C., López-Gómez, M. A., Sorensen, G., Hopcia, K., Hashimoto, D. M., . . . Sabbath, E. L. (Under review). Workplace Discrimination and Short Sleep among Healthcare Workers: The Buffering Effect of People-Oriented Culture. <i>Journal of Occupational and Environmental Medicine</i> . Maglalang, D. D., Sorensen, G., Hopcia, K., Hashimoto, D. M., Katigbak, C., Pandey, S., . . . Sabbath, E. L. (Under review). Job and Personal Demands and Burnout Among Healthcare Workers: The Moderating Role of Workplace Flexibility. <i>SSM Population Health</i>	Postdoctoral Researcher, Stanford Prevention Research Center, Stanford University, School of Medicine
Julie Miller (pre-doc, Boston College) 2015-2019	BHWHS	Job satisfaction and the psychosocial work environment: Does the relationship vary by worker age? Miller JA, Hopcia K, Wagner GR, Boden LI, Hashimoto D, Sorensen G, Sabbath EL. <i>Journal of Workplace Behavioral Health</i> . 2019; 33(3-4):221-240.	Research Scientist, AgeLab, Massachusetts Institute of Technology
Marta Pilotto, (Fulbright Fellow, pre- doc, visiting student) 2019-2020		Adding Total Worker Health® principles into dissertation focused on the Organizational well-being in the Italian and U.S. occupational health and safety legal framework.	Doctoral student in Comparative and European Legal Studies, University of Trento, Italy
Elisabeth Stelson (pre-doc) 2019-present	BHWHS Affiliated Projects	In progress: Using data from BHWHS in dissertation. Also received ERC funding: Substance Use Provider Occupational Wellbeing Study: Identifying Sources of Stress and Resilience Among Frontline Substance Use Workers (SUPs) in Massachusetts	National Cancer Institute Pre-Doctoral Fellow, and PhD student at Harvard T.H. Chan School of Public Health in the Department of Social and Behavioral Sciences

Hamid Roodbari (pre-doc, University of Sheffield) 2019-present	Affiliated projects	In progress. Manuscript in review: Organisational interventions to improve employees' mental health and wellbeing: A realist synthesis; Roodbari, Axtell, Sorensen, Nielsen; using data from Center affiliated research for his dissertation.	Doctoral Candidate, Management, University of Sheffield, UK.
Jie Yang (pre-doc, Boston College) 2013-2018	BHWHS	Paradoxical impact of a patient-handling intervention on injury rate disparity among hospital workers. Sabbath EL, Yang J, Dennerlein JT, Boden LI, Hashimoto D, Sorensen G. <i>American Journal of Public Health</i> , 2019; 109(4), 618-625.	Assistant Professor, School of Social Work, College of Health and Human Performance, East Carolina University

In addition, training opportunities have included the following:

- Yearly Harvard T.H. Chan School of Public Health Executive and Continuing Professional Education (ECPE) courses, including our annual ECPE TWH® course “Work, Health, and Wellbeing: Achieving Worker Health” and a course titled “Ergonomics and Human Factors, Strategic Solutions for the prevention of work-related MSD's” (Dennerlein, course director), which incorporates TWH® principles.
- Academic Courses to Build the Capacity of the TWH® Workforce, including incorporating TWH® principles in the content of existing courses at HSPH, Northeastern, and Boston College.
- Seminars sponsored by the Center in collaboration with the Harvard T.H. Chan School of Public Health Education and Research Center
- Webinars presented in collaboration with other organizations,
- Participation in the development of a HarvardX Massive Open Online Course (MOOC) focusing on building a culture of health as a business imperative.

See details below in **C.1 Publications, conference papers, and presentations**

B.5. How did you disseminate the results to communities of interest?

We presented our work in 46 peer-reviewed publications and investigators presented our work at more than 150 presentations, seminars throughout this reporting period, including for example at the 2019 Work, Stress and Health Conference in Philadelphia, PA (See Section C.1 Publications, conference papers, and presentations for complete listings.)

Our efforts to disseminate the results of the Center's research and TWH® approaches were central to the work of the Outreach Core as well as our research projects. The Center's Implementation Manual articulates evidence-based guidelines for implementing TWH® approaches and provides a foundation for our dissemination efforts through multiple venues as well as other Center resources. The Guidelines provided a direct link from our research findings to policy and practice implications. The Center also established an active Twitter account (#HSPHCenterWork), and a LinkedIn account for dissemination of our work.

We systematically compiled and synthesized our research findings across our three Research Projects, into “Policy Implication Summary Sheets” with the objective of converting scientific information into useable products. The Summary Sheets are posted to our website and were also presented at a range of conference including at the National Conference on Worker Health and Safety (COSHCON17) conference sponsored by the National Council for Occupational Safety and Health (National COSH), and attended by workers, labor unions, OSHA administrators and researchers. We posted Case Studies to our website provide concise summaries of our work illustrating organizational change using a Total Worker Health® integrated approach. We also created a website page dedicated to providing resources for implementing organizational projections for front-line workers from the spread of the COVID-19. Our website also lists our Center and Center affiliated project publications with links to abstracts, upcoming Center events such as presentations and seminars as well as recordings of Center seminars and webinars.

The Policy Working Group systematically reviewed all Center publications and articulated policy related themes across our research. This review, led by two of our post-doctoral fellows in collaboration with Drs. Wagner and Sorensen, was published in 2019 (Literature Review of Policy Implications from Findings of the Center for Work, Health and Well-being. Gómez MAL, Sparer-Fine E, Sorensen G, Wagner G. Journal of Occupational and Environmental Medicine. 61(11):868-876, November 2019).

We partnered with a range of employers to communicate our research findings and support for TWH® approaches. These efforts included ongoing development of tools and resources with Health Partners MGB, and our partner construction companies, as well as the Massachusetts Department of Public Health, and through our affiliated project with Sodexo, LLC.

B.6 - What do you plan to do during the next reporting period to accomplish the goals?

Not applicable

C. PRODUCTS

C.1 Publications, conference papers, and presentations

Publications

1. Dennerlein JT, Eyllon M, Garverich S, Weinstein D, Manjourides J, Vallas SP, Lincoln AK. Associations Between Work-Related Factors and Psychological Distress Among Construction Workers. Journal of Occupational and Environmental Medicine. 2021 Dec 1;63(12):1052-7.doi: 10.1097/JOM.0000000000002311
2. Kelly KM, Newman LS, Cherniack M, Punnett L, Hammer LB, Sorensen G. Critical Points in Lemke's Total Worker Health Calculus. J Occup Environ Med. 2021 Nov 1;63(11):e821-e822. doi: 10.1097/JOM.0000000000002300. PMID: 34138825; PMCID: PMC8711778.
3. Collins JE, Boden LI, Gundersen DA, Katz JN, Wagner GR, Sorensen G, Williams JAR. Workplace Integrated Safety and Health Program Uptake in Nursing Homes: Associations with Ownership. Int J Environ Res Public Health. 2021 Oct 28;18(21):11313. doi: 10.3390/ijerph182111313. PMID: 34769830; PMCID: PMC8583467.
4. Maglalang DD, Katigbak C, Gómez MA, Sorensen G, Hopcia K, Hashimoto DM, Pandey S, Takeuchi DT, Sabbath EL. Workplace Discrimination and Short Sleep Among Healthcare Workers: The Buffering Effect of People-Oriented Culture. Journal of Occupational and Environmental Medicine. 2021 Oct 1;63(10):857-64. doi: 10.1097/JOM.0000000000002246
5. Maglalang DD, Sorensen G, Hopcia K, Hashimoto DM, Katigbak C, Pandey S, Takeuchi D, Sabbath EL. Job and family demands and burnout among healthcare workers: The moderating role of workplace flexibility. SSM Popul Health. 2021 Apr 22;14:100802. doi: 10.1016/j.ssmph.2021.100802. PMID: 33997249; PMCID: PMC8102798

6. Peters SE, Sorensen G, Katz JN, Gundersen DA, Wagner GR. Thriving from Work: Conceptualization and Measurement. *International Journal of Environmental Research and Public Health*. 2021 Jan;18(13):7196. doi.org/10.3390/ijerph18137196
7. Williams JAR, Vrinotis MG, Gundersen DA, Boden LI, Collins JE, Katz JN, Wagner GR, Sorensen G. How to ask: Surveying nursing directors of nursing homes. *Health Sci Rep*. 2021 Jun 4;4(2):e304. doi: 10.1002/hsr2.304. PMID: 34136659; PMCID: PMC8177897.
8. Pronk NP, McLellan DL, Dennerlein JT, Anderson P, Karapanos M, Nagler E, Schmidt D, Spoonheim J, Wallace LM, Sorensen G. Building Capacity for Integrated Occupational Safety, Health, and Well-Being Initiatives Using Guidelines for Total Worker Health® Approaches. *J Occup Environ Med*. 2021 May 1;63(5):411-421. doi: 10.1097/JOM.0000000000002157. PMID: 33560069.
9. López Gómez MA, Gundersen DA, Boden LI, Sorensen G, Katz JN, Collins JE, Wagner G, Vrinotis MG, Williams JA. Validation of the Workplace Integrated Safety and Health (WISH) assessment in a sample of nursing homes using Item Response Theory (IRT) methods. *BMJ Open*. 2021 Jun 18;11(6):e045656. doi: 10.1136/bmjopen-2020-045656. PMID: 34145013; PMCID: PMC8215260.
10. Sorensen G, Dennerlein JT, Peters SE, Sabbath EL, Kelly EL, Wagner GR. The future of research on work, safety, health and wellbeing: A guiding conceptual framework. *Soc Sci Med*. 2021 Jan;269:113593. doi: 10.1016/j.socscimed.2020.113593. Epub 2020 Dec 8. PMID: 33341740.
11. Spoonheim JB, Pronk NP. Improving health and well-being at work: A case report from the field. *ACSM's Health & Fitness Journal*. 2021;25(5):71-73.
12. Katherine J. Igoe. Pronk NP and Dennerlein J How COVID-19 has changed the standards of worker safety and health – and how organizations can adapt. Interview for Harvard School of Public Health. *How COVID-19 Has Changed the Standards of Worker Safety and Health — and How Organizations Can Adapt*. 2021.
13. Gómez MAL, Williams JAR, Boden L, Sorensen G, Hopcia K, Hashimoto D, and Sabbath E The relationship of occupational injury and use of mental health care. *Journal of Safety Research*. September 2020; 74:227-232.
14. Peters SE, Trieu HD, Manjourides J, Kat, JN and Dennerlein JT . Designing a Participatory Total Worker Health® Organizational Intervention for Commercial Construction Subcontractors to Improve Worker Safety, Health, and Well-Being: The “ARM for Subs” Trial Int. J. Environ. Res. Public Health 2020, 17, 5093; doi:10.3390/ijerph17145093. PMID: 32679687 PMCID: PMC7400451
15. Dennerlein JT, Burke L, Sabbath E L, Williams JAR, Peters SE, Wallace L, Karapanos M, Sorensen G. An Integrative Total Worker Health Framework for Keeping Workers Safe and Healthy During the COVID-19 Pandemic (2020). *Human Factors* doi.org/10.1177/0018720820932699. PMC7346710
16. Newman LS, Scott JG, Childress A, Linnan L, Newhall WJ, McLellan DL, Campo S, Freewynn S, Hammer LB, Leff M, Macy G, Maples EH, Rogers B, Rohlman DS, Tenney L, Watkins C. J. Education and Training to Build Capacity in Total Worker Health®: Proposed Competencies for an Emerging Field *Occup Environ Med* 2020 Aug;62(8):e384-e391. doi: 10.1097/JOM.0000000000001906 PMID: 32404840 PMCID: PMC7409771
17. Gómez MAL, Sabbath E, Boden L, Williams JAR, Hopcia K, Hashimoto D, Sorensen G Organizational and Psychosocial Working Conditions and Their Relationship With Mental Health Outcomes In Patient-Care Workers *J Occup Environ Med* 2019 Dec;61(12):e480-e485. PMID: 31651598 DOI: 10.1097/JOM.0000000000001736

18. Pronk NP Public health, business, and the shared value of workforce health and wellbeing
Lancet Public Health. 2019 Jul;4(7):e323. doi: 10.1016/S2468-2667(19)30078-7.
19. Gómez MAL, Sparer-Fine E, Sorensen G, Wagner G Literature Review of Policy Implications from Findings of the Center for Work, Health and Well-being.. J Occup Environ Med 2019 Aug 24. doi: 10.1097/JOM.0000000000001686. [Epub ahead of print]. PMID: 31453894. PMC6842102
20. Perceived Workplace Health and Safety Climates: Associations With Worker Outcomes and Productivity. Katz AS, Pronk NP, McLellan DL, Dennerlein J, Katz JN. Am J Prev Med. 57(4):487-494 OCT 2019.
21. Sabbath, E.L., Yang, J., Dennerlein, J.T., Boden, L.I., Hashimoto, D., Sorensen, G Paradoxical Impact of a Patient-Handling Intervention on Injury Rate Disparity Among Hospital Workers.. Am J Public Health 2019 Apr;109(4):618-625. PMID: 30789763. PMCID: PMC6417584
22. Miller, J.A., Hopcia, K., Wagner, G.R., Boden, L.I., Hashimoto, D., Sorensen, G., Sabbath, E.L Job satisfaction and the psychosocial work environment: Does the relationship vary by worker age?. J Workplace Behav Health 2019 Mar; 33(3-4):221-240.
23. Manjourides J, Dennerlein JT. Testing the associations between leading and lagging indicators in a contractor safety pre-qualification database. Am J Ind Med 2019 Apr; 62(4), 317-324. PMID: 30724373 PMCID: PMC7666568 DOI: 10.1002/ajim.22951
24. Estabrooks PA, Brownson RC, Pronk NP Dissemination and Implementation Science for Public Health Professionals: An Overview and Call to Action. Prev Chronic Dis. 2018 Dec 20;15:E162. doi: 10.5888/pcd15.180525. Review. PMID: 30576272. PMCID: PMC6307829
25. Tamers SL, Goetzel R, Kelly KM Research Methodologies for Total Worker Health®: Proceedings From a Workshop. , et al. J. Occup Environ Med. 60(11):968–978, NOV 2018. PMC6221402
26. Schult TM, Nagler EM, Sorensen G Employee Perceptions of Safety, Health, and Well-Being: Focus Group Findings From One Veterans Affairs Medical Center. , et al. J Occup Environ Med. 2018 Nov;60(11):e582-e588.
27. Shaw WS, Nelson CC, Woiszwilllo MJ, Gaines B, Peters SE Early Return to Work Has Benefits for Relief of Back Pain and Functional Recovery After Controlling for Multiple Confounds. J Occup Environ Med. 2018 Oct;60(10):901-910. doi: 10.1097/JOM.0000000000001380. PMID: 29933319. PMCID: PMC6200378.
28. Peters SE, Grant MP, Rodgers J, Manjourides J, Okechukwu CA, Dennerlein JT A Cluster Randomized Controlled Trial of a Total Worker Health® Intervention on Commercial Construction Sites. International Journal of Environmental Research and Public Health. 2018; 15(11):2354. PMCID: PMC6265748.
29. Sabbath, EL, Williams, JAR, Boden, LI, Tempesti, T, Wagner, GR, Hopcia, K, Hashimoto, D, Sorensen, G. Mental Health Expenditures: Association with Workplace Incivility and Bullying Among Hospital Patient Care Workers. J Occup Environ Med. August 2018; 60(8):737-742. PMCID: PMC6086762
30. Sabbath, E.L., Hashimoto, D., Boden, L.I., Dennerlein, J., Williams, J.A.R., Orechia, T., Hopcia, K., Tripodis, Y., Wagner, G.R., Sorensen, G Cohort Profile: The Boston Hospital Workers Health Study.. Int J Epidemiol. 2018 Dec 1;47(6):1739-1740g. doi: 10.1093/ije/dyy164.
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33. Measuring best practices for workplace safety, health and wellbeing: The Workplace Integrated Safety and Health Assessment.. *J Occup Environ Med* 2018 May;60(5):430-439. doi: 10.1097/JOM.0000000000001286. PMC5943154
34. Manjourides J, Sparer EH, Okechukwu CA, Dennerlein JT The Effect of Workforce Mobility on Intervention Effectiveness Estimates. *Ann Work Expo Health* 2018 Mar 12;62(3):259-268. doi: 10.1093/annweh/wxx112. PMCID: PMC5873524
35. Dennerlein, JT, O'Day ET, Mulloy, DF, Somerville J, Stoddard, AM, Kenwood, C, Teeple E, Boden, LI, Sorensen G, Hashimoto D. Lifting and exertion injuries decrease after implementation of an integrated hospital-wide safe patient handling and mobilisation programme. *Occup Environ Med* 2017;74:336–343.
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41. Williams JA, Sorensen G, Hashimoto D, Hopcia K, Wagner GR, Boden LI Impact of occupational injuries on nonworkers' compensation medical costs of patient-care workers. *J Occup Environ Med.* 2017; 59(6):e119-24. PMCID: PMC5488856.
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Presentations

Sorensen G. Keynote Speaker, Occupational Health Psychology Summer Institute 2016 Program: OHP Innovation and Creative Strategies Leading to Total Worker Health. "Work and Health: Evidence on the Pathways to Implementing Total Worker Health," Portland State University, Portland, OR. July 2016.

Okechukwu, C. Beyond White Collars: Bringing an expanded view of occupational health into health disparities research. Plenary session of the Robert Wood Johnson Foundation Health and Society Program final meeting. New Orleans, LA. May, 2016

Okechukwu, C. Basic, J. Work-family support impacts turnover intentions and care quality in nursing homes. Gerontological Society of America. New Orleans, LA. November, 2016

Okechukwu, C, Kelly, E., Basic, J., DePasquale, N., Hurtado, D., Kossek, E. Sembajwe, G. Impacts of Work-family support on low wage workers' job performance. Paper presented at the Work and Family Researchers Meeting. Washington DC. June, 2016

Sorensen G, Dennerlein JT, McLellan D, Sabbath EL, Pronk NP, Wagner GR. A conceptual model to guide Total Worker Health® research and interventions. *Expanding Research Partnerships: The State of the Science.* Aurora, Colorado, June 20 - 22, 2017

Sparer E, Wagner G, Adamkiewicz G, Hart J, Prendergast D, Apell J, Bartzak M, Sorensen G. Assessment of Ambient Exposures Firefighters Encounter while at the Fire Station: An Exploratory Study: *The State of the Science.* Aurora, Colorado, June 20 - 22, 2017

Sabbath, EL. Design, construction, and management of a comprehensive employee research database: the PERDS study of the Harvard Center for Work, Health, and Wellbeing. *Expanding Research Partnerships: The State of the Science.* Aurora, Colorado, June 20 - 22, 2017

Sabbath, EL, Boden, LI, Stoddard, A, Hashimoto, D, Hopcia, K, Sorensen, G. "Design, construction, and management of a comprehensive employee research database: the Boston Hospital Workers Health Study (BHWHS) of the Harvard Center for Work, Health, and Wellbeing." Oral presentation, *Expanding Research Partnerships: State Of The Science Conference (NIOSH)*, Aurora, CO. June 2017.

Dennerlein, J. Safety Culture and Climate: Construction Worker Safety and Health. New England Chapter of American Industrial Hygiene Meeting, Norwood, MA 1 November 2017

- Dennerlein, J. The effects of systems and design on employee health and safety from the office to the construction site: identifying causal pathways through modern ergonomics and human factors. Student Chapter of the Human Factors and Ergonomics Society, Virginia Tech, Blacksburg, VA 16 November 2017
- Dennerlein, J. Making the Business Case for Total Worker Health®. Workers' Comp Educational Conference and Annual Safety & Health Conference, Orlando, FL August 20, 2018.
- Dennerlein, J. A Cluster Randomized Controlled Trial of a Total Worker Health® Intervention on Commercial Construction Sites. 2nd International Symposium to Advance *Total Worker Health*®, Bethesda, MD, May 2018.
- Dennerlein, J. Global Partnerships in Total Worker Health®: Lessons Emerging from Chile. 2nd International Symposium to Advance *Total Worker Health*®, Bethesda, MD, May 9, 2018.
- Dennerlein, J, Lopez Gomez, MA & Peters, SE. Health and safety interventions for professional drivers: A scoping review. 2nd International Symposium to Advance *Total Worker Health*®, Bethesda, MD, May 9, 2018.
- Hashimoto, D. Evaluation of Unit-Based Organizational Policies within an Academic Health Care System. 2nd International Symposium to Advance *Total Worker Health*®, Bethesda, MD, May 9, 2018.
- McLellan, DL. Health Enhancement Research Organization (HERO). Exploring the association between organizational safety and health climates and two productivity measures. September 17, 2017.
- Kelly, EL, Berkman, LF, Fox, K, Sabbath, EL, Allen, T, Gryzwacz, J, Kubzansky, L. "Work & Wellbeing: A Work-family Dialogue." Oral presentation, Work and Family Researchers Network Conference, Washington, DC. June 2018.
- Miller, J, Sabbath, EL. Job Satisfaction and the Psychosocial Work Environment: Examining Age Differences Among Hospital Patient Care Workers. Poster presentation at the International Association of Gerontology and Geriatrics (IAGG) World Congress in San Francisco, July 23-27, 2017.
- McLellan, DL. Implementing an Integrated Approach to Worker Safety, Health, and Well-being: Frameworks, Evidence, and Applications", Workplace Health Science & Practice workshop at the American Heart Association's EPI/Lifestyle Scientific Sessions 2018 Conference. New Orleans, LA, March 22, 2018.
- McLellan, DL. Workforce Development Panel: Lessons Learned and Next Steps. 2nd International Symposium to Advance *Total Worker Health*®, Bethesda, MD, May 9, 2018.
- McLellan, DL. Partnering into Practice: Research Practice Partnerships for *Total Worker Health*®. 2nd International Symposium to Advance *Total Worker Health*®, Bethesda, MD, May 10, 2018.
- Nagler, E, Permuth, R. Considerations for Working with a Large Employer. 2nd International Symposium to Advance *Total Worker Health*®, Bethesda, MD, May 10, 2018.
- Nagler, E, Schult, T. Employee safety, health and well-being focus group findings from one Veterans Affairs medical center. 2nd International Symposium to Advance *Total Worker Health*®, Bethesda, MD, May 10, 2018.
- Pronk, NP. The Role of Research in Evidence-Based Policy for Health & Well-Being: TWH® Related Research in a Broader Context. 2nd International Symposium to Advance *Total Worker Health*®, Bethesda, MD, May 9, 2018.
- Pronk, NP. Partnership with Vendors: Measurement for Total Worker Health®. 2nd International Symposium to Advance *Total Worker Health*®, Bethesda, MD, May 9, 2018.

Pronk NP. Well-being as a clinical goal: Addressing how people evaluate their life. 31st Annual Primary Care Update. Terry C. Shackelford, MD, Memorial Lecture Keynote Speaker. Minneapolis, MN, November, 2017.

Pronk NP. Willem and the Workplace: A Perspective from the Land of 10,000 Lakes. Last Lecture event celebrating the career of Professor Dr. Willem van Mechelen at the Vrije Universiteit in Amsterdam, The Netherlands, September, 2017.

Pronk NP, Katz A, McLellan D, Dennerlein J, Katz J. Associations between conditions of work and worker health and productivity indicators in small manufacturing companies. Work, Stress, and Health Conference. Minneapolis, MN, June, 2017.

Pronk NP. Climate change and health. CleanMed Conference. Minneapolis, MN May, 2017.

Sabbath, EL. Individual vulnerabilities, work organizational factors, and injury risk: A study of disparities in hospital patient care workers. 2nd International Symposium to Advance *Total Worker Health*[®], Bethesda, MD, May 2018.

Sabbath, EL. Preventive care utilization: Association with individual- and workgroup-level policy and practice perceptions. 2nd International Symposium to Advance *Total Worker Health*[®], Bethesda, MD, May 2018.

Sabbath, EL. "Sequence analysis: An emerging tool for lifecourse exposure assessment." Invited lecture, Department of Epidemiology and Biostatistics, University of California-San Francisco. February 2018.

Sabbath, EL. "Employee use of preventive and mental health care: Association with workplace policies and practices." Invited lecture, Dana-Farber Cancer Institute. December 2017.

Sabbath, EL, Sparer, E, Boden, LI, Hopcia, K, Hashimoto, D, Wagner, G, Sorensen, G. "Preventive care utilization: Association with individual- and workgroup-level policy and practice perceptions." Oral presentation, Second International Symposium to Advance Total Worker Health, Bethesda, MD. May 2018.

Sorensen, G, McLellan, D, Dennerlein, J, Sabbath, EL. "Working conditions as drivers and indicators of a Total Worker Health Framework." International Symposium to Advance Total Worker Health, Bethesda, MD. May 2018.

Sabbath, EL, Punnett, L, Olson, R. "Total Worker Health approaches in healthcare settings: Insights from long-term care, acute care, and home care." Symposium convened, Second International Symposium to Advance Total Worker Health, Bethesda, MD., May 2018.

Sorensen, G. Pathways to improving Worker Safety, Health and Wellbeing. Institute of Work Psychology, University of Sheffield (Sheffield, UK). May 22, 2018.

Sorensen, G. Global Partnerships in Total Worker Health: Lessons Emerging from India. 2nd International Symposium to Advance *Total Worker Health*[®], Bethesda, MD, May 9, 2018.

Sorensen, G., Pathways to Implementing Total Worker Health: Implications for Small Enterprises. Understanding Small Enterprises (USE) Conference, Worker well-being and sustainable business health: From ideas to achievable reality. Denver, CO. October 25–27, 2017.

Wagner, GR, Sorensen, G, Lopez Gomez, MA, Sparer, EH. Policy Matters for Total Worker Health. 2nd International Symposium to Advance *Total Worker Health*[®], Bethesda, MD, May 9, 2018.

Manjourides, J. Evaluating programs on dynamic construction sites: The effect of workforce mobility on intervention effectiveness estimates. 2nd International Symposium to Advance *Total Worker Health*[®], Bethesda, MD, May 10, 2018.

Sparer, EH. Partnering with the Boston Fire Department and Firefighter Union to Improve Fire Station Working Conditions. 2nd International Symposium to Advance *Total Worker Health*[®], Bethesda, MD, May 10, 2018.

Dennerlein, J. Demystifying Ergonomics in the Modern Office. Hallman Lecture, Applied Health Sciences, University of Waterloo, Ontario, CA. Oct 26, 2017.

Dennerlein, J. Ergonomics and the surgeon: Ideas to optimize performance and improve wellbeing. American Society for Reconstructive MicroSurgery Annual Meeting, Phoenix, AZ. Jan 14, 2018.

Katz, A. Exploring the association between organizational safety and health climates and two productivity measures. Understanding Small Enterprises (USE) Conference, Worker well-being and sustainable business health: From ideas to achievable reality. Denver, CO. Oct 25–27, 2017.

Pronk NP. Well-being as a clinical goal: Addressing how people evaluate their life. 31st Annual Primary Care Update. Terry C. Shackelford, MD, Memorial Lecture Keynote Speaker. Minneapolis, MN, Nov 10, 2017.

Sorensen, G., Pathways to Implementing Total Worker Health: Implications for Small Enterprises. (Keynote Address) Understanding Small Enterprises Conference, Worker well-being and sustainable business health: From ideas to achievable reality. Denver, CO. Oct 25, 2017.

Sparer EH, et al. Assessment of Ambient Exposures Firefighters Encounter While at the Fire Station: An Exploratory Study. NE College of Occupational and Environmental Medicine (NECOEM) Annual Meeting. Dec 1, 2017. Newton, MA.

Sparer EH, et al. Healthy Buildings, Healthy Firefighters. Fire Chiefs Assoc of Massachusetts, Annual Meeting. Feb 2018. Watertown, MA.

Wagner, GR. Integrated research on complex, integrated systems: Challenges and Opportunities. Integrated workplace programs research symposium. October 26, 2017. Sponsor: WorkSafe, Victoria.

Wagner, GR. Keynote: (Mental Wellbeing Collaboration Breakfast): Leading for Mental Wellbeing in the 21st Century Workplace. Oct 24, 2017. Sponsors: WorkSafe, Victoria; SuperFriend, Victoria; Vic Health, Victoria.

Wagner, GR. Keynote (Health & Safety Month, 2017): The forefront of health and safety--an international perspective on the integrated approach to health, safety and wellbeing. Sponsor: WorkSafe, Victoria. Oct 31, 2017.

Wagner, GR. If work makes you happy, is it work?: exploring the intersections of work, happiness, and wellbeing. Invited seminar, Harvard Center for Health and Happiness, Jan, 2018.

Dennerlein, J. Making the Business Case for Total Worker Health[®]. Workers' Comp Educational Conference and Annual Safety & Health Conference, Orlando, FL Aug 20, 2018.

Kelly, EL, et al. "Work & Wellbeing: A Work–family Dialogue." Oral presentation, Work and Family Researchers Network Conference, Washington, DC. June 2018.

McLellan, DL. Implementing an Integrated Approach to Worker Safety, Health, and Well-being: Frameworks, Evidence, and Applications", Workplace Health Science & Practice workshop at the American Heart Association's EPI/Lifestyle Scientific Sessions 2018 Conference. New Orleans, LA, Mar 22, 2018.

Sorensen, G. Pathways to improving Worker Safety, Health and Wellbeing. Institute of Work Psychology, University of Sheffield (Sheffield, UK). May 22, 2018.

Boden, LI. 2018 National COSH Conference. Working Conditions and Health in the Nursing and Construction Industries. Baltimore, MD. December 4-6, 2018.

Collins, J. The Association between Structural and Symptomatic Progression in Knee Osteoarthritis. The American College of Rheumatology/The Association of Rheumatology Health Professionals. October 21- 24, 2018

Dennerlein, J. Building a culture of safety, health, and wellbeing for construction workers: Overcoming (or not) the industry's organizational challenges. MIT Institute for Work and Employment Research. *February 12, 2019.*

Dennerlein, J. Testing the Associations Between Leading and Lagging Indicators in a Contractor Safety Pre-Qualification Database. CDC National Occupational Injury Research Symposium (NOIRS). Morgantown, WV. October 17, 2018

Maria, LS and Dennerlein, J. Safety Climate and its Relationship with Construction Company Safety Management Systems and Programs. CDC National Occupational Injury Research Symposium (NOIRS). West Virginia. Oct 17, 2018.

López Gómez, MA. The relationship of occupational injury and use of mental health care. CDC National Occupational Injury Research Symposium (NOIRS). West Virginia. Oct 16-18, 2018.

López Gómez, MA. Pathways to a healthier workplace for patient-care workers. The Yerby Symposium at the Harvard T.H. Chan School of Public Health. Boston, MA. March 4, 2019.

Peters SE. Impact of working conditions on return-to-work following work-related injury. Sheffield Management School, Sheffield, U.K. January 3, 2019.

Peters, SE, Sabbath, EL, Lopez Gomez, MA, Sorensen, G. The Relationship Between Working Conditions And Return-to-work Following Work-related Injury in a Cohort of Patient Care Workers. Work Disability Prevention and Innovation Conference. Odense, Denmark June 4-7, 2019.

Peters, SE, Shaw, W. Subgroups of At-Risk Workers With Chronic Physical Health Conditions: From The MANAGE AT WORK Randomized Controlled Trial. Work Disability Prevention and Innovation Conference. Odense, Denmark June 4-7, 2019.

Peters, SE, Nagler, E, Nielsen, K, Sorensen, G. Worker-centered Approaches for Developing An Integrated Organizational Intervention to improve low wage worker health, safety and wellbeing. Work Disability Prevention and Innovation Conference. Odense, Denmark. June 4-7, 2019.

Sabbath, EL, Yang, J., Dennerlein, J.T., Boden, L.I., Wagner, G.R., Hopcia, K., Hashimoto, D., Sorensen, G. The inequality paradox: Hospital-based safe patient handling intervention decreases overall worker injuries and pain, but widens socioeconomic disparities. Society for Social Work and Research. San Francisco, CA. January 2019.

Sabbath, EL, Yang, J., Dennerlein, J.T., Boden, L.I., Wagner, G.R., Hopcia, K., Hashimoto, D., Sorensen, G. The inequality paradox: Hospital-based safe patient handling intervention decreases overall worker injuries and pain, but widens socioeconomic disparities. National Occupational Injury Research Symposium (NOIRS), Morgantown, WV. October 2018.

Sabbath, EL. Occupational health disparities: Harnessing the power of administrative data to reveal inequities. Department of Environmental Health, Boston University School of Public Health. February 2019

Sabbath, EL. Can a successful intervention widen health disparities? Evidence of the inequality paradox in a workplace safety intervention. Industrial/ Organizational Psychology, Department of Psychological Sciences, University of Connecticut. October 2018.

Sorensen, G. Innovation in Worksite Wellness: Elevating the Standard of Well-Being. Invited Keynote. Worksite Wellness Council of Massachusetts (WWCMA). Foxboro, MA. October 11, 2018.

Wagner, GR. The Total Worker Health® Framework: its history, evolution, and future. Danish Working Environment Authority. March 11, 2019.

Williams, JAR. Measuring best practices in worker safety, health and wellbeing. Invited Keynote. AAOHN's 2019 National Conference. Jacksonville, FL. April 10, 2019.

Burke, L. The Center for Work, Health, & Well-being: Four Pillars of Our Approach. Work Stress and Health Conference, Philadelphia, PA. November 6-9, 2019.

Dennerlein, J. Fitting an intervention into the context of small construction sub-contractor company: Lessors learned from a pilot study. Work Stress and Health Conference, Philadelphia, PA. November 6-9, 2019.

Dennerlein, J. Partnering with construction companies for health and safety research adds value in a shared mission for improvement. Work Stress and Health Conference, Philadelphia, PA. November 6-9, 2019.

Dennerlein, J. et al. Associations between work factors and psychological distress in a convenience sample of commercial construction workers. Work Stress and Health Conference, Philadelphia, PA. November 6-9, 2019.

Katz, A. Application of Implementation Guidelines in a health services vendor: the WISH@Work pilot. Work Stress and Health Conference, Philadelphia, PA. November 6-9, 2019.

López Gómez, MA, Sorensen, G, Katz, J, et al. Validation of the Workplace Integrated Safety and Health (WISH) Assessment. Work Stress and Health Conference, Philadelphia, PA. November 6-9, 2019.

López Gómez, MA, Sabbath, EL, Williams, JAR, et al. Organizational and psychosocial working conditions and their relationship with mental health outcomes in patient-care workers. Work Stress and Health Conference, Philadelphia, PA. November 6-9, 2019.

McLellan, DL. Implementation guidelines for integrated approaches to work, health and well-being. Work Stress and Health Conference, Philadelphia, PA. November 6-9, 2019.

Nagler, E. Using Guidelines for planning and implementing an integrated intervention for food service workers. Work Stress and Health Conference, Philadelphia, PA. November 6-9, 2019.

Peters, S., Manjourides, J., Dennerlein, JT. Developing an integrated health and safety intervention for subcontractors in the construction industry. Work Stress and Health Conference, Philadelphia PA. November 6-9, 2019.

Sabbath, EL. The mutual benefits of data-sharing for employers and academic researchers: Examples from the Boston Hospital Workers Health Study. Work Stress and Health Conference, Philadelphia, PA. November 6-9, 2019.

Sorensen, G. Promoting safety, health and wellbeing for low-wage workers: Changing the Work Organization. Work Stress and Health Conference, Philadelphia, PA. November 6-9, 2019.

Williams, JAR. Confronting challenges in collaboration: Examples from the nursing home industry. Work Stress and Health Conference, Philadelphia, PA. November 6-9, 2019.

Dennerlein, J. and Wagner, G. Building and sustaining a psychologically safe work environment using the TWH® framework. Danish Working Environment Authority. March 12, 2019. [Day-long workshop about Total Worker Health® (US) and Work Improvement Network (Australia)]

Sparer E, Wagner G, Sorensen G. Improving Firefighter Safety and Health: A Closer Look at the Role of the Fire Station. APA/NIOSH Work, Stress, and Health conference, Minneapolis, MN June 2017.

Sabbath, EL. Workplace mistreatment and bullying: Is exposure associated with hospital workers' mental health care expenditures? Role: Presenter. APA/NIOSH Work, Stress, and Health conference, Minneapolis, MN June 2017.

Oldenburg B, Symposium Chair; Presenters: Dennerlein JT, Joss N, Sorensen G, Mortensen O. Implementing integrated approaches to Total Worker Health® indifferent national contexts. APA/NIOSH Work, Stress, and Health conference, Minneapolis, MN June 2017.

Sabbath, EL, Boden, LI, Williams, JAR, Hashimoto, D, Hopcia, K, Sorensen, G. "Racial disparities in occupational injury: Obscured by administrative data?" Oral presentation, APA/NIOSH Work, Stress, and Health meeting, Minneapolis, MN. June 2017.

Sabbath, EL, Williams, JAR, Boden, LI, Tempesti, T, Wagner, GR, Hopcia, K, Hashimoto, D, Sorensen, G. "Worker mistreatment and bullying: Is exposure associated with hospital workers' mental health expenditures?" Oral presentation, APA/NIOSH Work, Stress, and Health meeting, Minneapolis, MN. June 2017.

EL Sabbath, Symposium Chair; Presenters: Nagler E, Sparer E, Dennerlein J, Pronk N.. Symposium: The Harvard/NIOSH TWH® Center of Excellence: Research innovations in healthcare, construction, and small/medium-sized businesses, APA/NIOSH Work, Stress, and Health conference, Minneapolis, MN June 2017.

Sparer E, Hashimoto D, Dennerlein J, Wagner G, Sabbath E, Kenwood C, Nagler E, Boden L, Sorensen G. The relationship between organizational policies and practices with work limitations within a cohort of hospital patient care workers. APA/NIOSH Work, Stress, and Health conference, Minneapolis, MN June 2017.

Katz A, Pronk N, McLellan D, Dennerlein J, Katz J. HERO Forum 17 on Engagement and the Emerging Workforce: Exploring the association between organizational safety and health climates and two productivity measures. Phoenix, AZ. September 12-14, 2017.

Pronk N, Katz A, McLellan D, Dennerlein J, Katz J. Associations between conditions of work and worker health and productivity indicators in small manufacturing companies. APA/NIOSH Work, Stress, and Health conference, Minneapolis, MN June 2017.

Williams, JA, Sorensen G, Schult TA, Wagner G, Katz JN, Pronk NP, McLellan DL. Measuring integrated approaches to advance worker safety, health and wellbeing. APA/NIOSH Work, Stress, and Health conference, Minneapolis, MN June 2017

Sorensen G. 3rd Annual Mutual Summit: Trends and Experiences in Safety and Health at Work. "Work, Safety and Health: Finding Common Pathways for Maximum Impact," Santiago, Chile. May 2016.

Seminars/Webinars

- Sorensen G. MIT Institute for Work and Employment Research (IWER) Seminar. "Work and Health: Pathways to Implementing Integrated Approaches to Worker Health, Safety and Wellbeing," Massachusetts Institute of Technology, Cambridge, MA. September 2016
- Sparer E. Assessing Ambient Exposures Firefighters Encounter while at the Fire Station: A Feasibility Study. Harvard T.H. Chan School of Public Health Education and Research Center (ERC) Pilot Presentation, Boston, MA, January 30, 2017.
- Sorensen, G. Dennerlein, J. Massachusetts Department of Public Health Working on Wellness Expert Series Webinar: Improving Conditions of Work: What Impacts Worker Health? December 6, 2017.
- Sorensen, G. BETA Healthcare Group. Improving Conditions of Work: What Impacts Health & Safety for Healthcare Workers? February 21, 2018.
- Sorensen, G. Work Wellness and Disability Prevention Institute. Integrated Strategies for Worker Safety and Health: A Conceptual Model for Intervention and Research. February 22, 2018.
- Sorensen, G. New England College of Occupational and Environmental Medicine (NECOEM) and Harvard T.H. Chan School of Public Health Webinar: Improving Conditions of Work: What Impacts Health, Safety, and Well-being? April 4, 2018.
- Dennerlein, J. A Total Worker Health® Intervention on Commercial Construction Sites. Work Wellness and Disability Prevention Institute. September 18, 2018.
- Sorensen, G. Innovations in Worker Safety, Health and Wellbeing: Applications from Total Worker Health®. Michigan Wellness Council. March 6, 2019.
- Sorensen, G. Measuring Best practices for Workplace Safety, Health, and Well-being. Work Wellness and Disability Prevention Institute. March 28, 2019.
- Sorensen, G. Total Worker Health®. Society for Petroleum Engineers & Southwest Center for Occupational and Environmental Health at the UTHealth School of Public Health in Houston. May 8, 2019.
- McLellan, D. Weaving Employee Health, Safety, and Well-Being into the Fabric of Your Organization. Work Wellness and Disability Prevention Institute, April 9, 2019.
- Dennerlein, J, Sabbath, EL, and Williams, JAR. What is Total Worker Health® and how does it relate to Nursing Homes? Massachusetts Senior Care Association. May 16, 2019.
- Sorensen, G. Invited Presenter. "Fostering a Culture of Health in the Time of COVID-19." Assuring a Culture of Health & Performance. Webinar presented by IBM Watson Health in partnership with Harvard T. H. Chan School of Public Health. October 20, 2020.
- Sorensen, G. Keynote Speaker. How will the future of work shape research issues, methods and applications? A workshop. "The future of research in Work, Safety and Health." The University of Texas School of Public Health webinar series. June 4, 2020.
- Peters, S.E. Organizational Approaches to Total Worker Health for Low-Income Workers. NORA Services Sector Council. February 25, 2020.
- Dennerlein JT. Implementing Total Worker Health® organizational interventions targeting conditions of work: Common themes across multiple industries. Institute of Work Psychology International Conference 2020, 24 June 2020, Sheffield, Great Britain. <http://iwppconference.group.shef.ac.uk/>

Dennerlein, JT. Invited Speaker. "Expanding ergonomics to improve human wellbeing: From Job Rotation to Total Worker Health." Western Occupational Safety and Health Network (WOSH) Meeting ORCHSE Strategies, Sonoma, California 25 February 2020 <https://www.orchse-strategies.com/our-networks/western-occupational-safety-and-health-network/>

Dennerlein, JT. Invited Speaker. "Total Worker Health® approaches to foster worker & organizational resilience during a pandemic." BSR Health Care Working Group Meeting, Remote Presentation, 18 November 2020 <https://www.bsr.org/en/collaboration/groups/healthcare-working-group>

Susan Peters, Development and validation of a measure of work-related wellbeing in the U.S. workforce, Susan Peters, Harvard Education and Research Center January 22, 2021

Courses/Panels

Sorensen G. Expert Panelist, NPR/Harvard T.H. Chan School of Public Health Forum: "Health in the American Workplace: Are We Doing Enough," Harvard T.H. Chan School of Public Health, Boston, MA, July 2016.

McLellan, DL. National Institute for Occupational Safety and Health Total Worker Health® Education and Training Roundtable. Subgroup Reports, Discussion and Synthesis. November 3, 2017.

Sorensen, G. Designing, implementing and evaluating organizational interventions. Nordic Institute for Advanced Training in Occupational Health. Copenhagen, Denmark. May 13-15, 2019. [participating faculty for a 3-day course, with Dr. Karina Nielsen of Sheffield University]

McLellan, DL. National Institute for Occupational Safety and Health Total Worker Health® Education and Training Roundtable. Training Audiences and Delivery. November 2, 2017.

Sorensen G. (Faculty). HarvardX: Improving your Business Through a Culture of Health. Massive Open Online Course (MOOC), May 2018.

Courses /Training through the Harvard T.H. Chan School of Public Health Executive and Continuing Professional Education

February 6-8, 2017 "Work, Health, and Wellbeing: Framework, Evidence, and Applications",

November 13-17, 2017 "Ergonomics and Human Factors, Strategic Solutions for the prevention of work-related MSD's"

April 18-20, 2018. The course titled "Work, Health, and Wellbeing: Framework, Evidence, and Applications"

September 9-12, 2019 "Ergonomics and Human Factors: Strategic Solutions for Workplace Safety and Health".

May, 2020: In-person course cancelled due to COVID-19 in-person restrictions

May 3-6, 2021, "Work Health and Well-Being: Achieving Worker Health"): Re-formatted and presented virtually due to continued COVID19 in-person restrictions.

Co-Sponsored Seminars with the Harvard Education and Resource Center (ERC)

November 7, 2016, "Redesigning Professional Work: Highlights from the Work, Family, and Health Network Experiment in a White-Collar Setting," Erin L. Kelly, PhD, Professor, Work and Organization Studies, Institute for Work and Employment Research, MIT Sloan School of Management

September 6, 2017: "Using multiple administrative data sources to determine the impacts of occupational injuries and of team consistency," Jessica Williams, PhD, Assistant Professor, University of Kansas Medical Center.

February 2, 2017, "The Importance of Context: Middle Managers' Influence on the Lives of Workers," Kimberley Fox, PhD, Assistant Professor, Bridgewater State University

March 20, 2017, "Making the business case for Total Worker Health for low-wage workers: A path forward," Cassandra Okechukwu, ScD, MSN.

November 18, 2019, Seung-Sup Kim, MD, MPH, ScD presented: "'We cannot use our bathrooms and break rooms:' A study of working conditions and health among cosmetic sales workers in South Korea."

December 16, 2019, Philip J. Landrigan, MD, MSc, FAAP presented "Pollution Climate Change and Health". Dr. Landrigan is the Director, Program in Global Public Health and the Common Good Director, Global Observatory on Pollution and Health

January 14, 2019: "Relational Coordination for Health and Wellness - At Work and in the Community," Jody Hoffer Gittel, PhD, Professor of Management at the Heller School for Social Policy and Management, Brandeis University.

April 22, 2019. "Comparing Survey-Measured Well-being across Groups: and the presenter is Toshar Kundu, Project Specialist for Professors Daniel Benjamin, Kristen Cooper, Ori Heffetz, and Miles Kimball at the National Bureau of Economic Research (NBER).

March 9, 2020. Leonard Zwack, ScD, "Notes from the Field: Results of Interesting and Unusual NIOSH Health Hazard Evaluations". Dr. Zwack is a lead industrial hygienist at the National Institute for Occupational Safety and Health Hazard Evaluations and Technical Assistance Branch in the Division of Surveillance, Hazard Evaluations, and Field Studies.

September 14, 2020, "The Black and Brown Essential Worker in the Time of COVID-19: How Systemic Economic and Health Racism Fueled Differential Outcomes during a Pandemic". Kenneth R. Alleyne, MD, FAAOS, Orthopedic Surgeon; Chair, Board of Directors of the Connecticut Health Foundation; Board Member, University of Connecticut Health Center

Nov 2, 2020 , "The Case For Masks", Dean Hashimoto, MD Chief Medical Office, Workplace Health and Wellness division at Mass General Brigham

March 8, 2021. COVID-19: Vaccines, Variants, Vaccinations and Work. John Howard, MD, MPH, JD, MBA Director, National Institute for Occupational Safety and Health (NIOSH), Washington, DC

Sponsored: invited speakers

December 15, 2017: "Occupational Health and Safety Vulnerability: Why we need a new measure," Peter Smith, PhD, Institute for Work and Health (Toronto, CA)

October 18, 2017: "Designing, implementing, and evaluating organizational interventions for worker health and wellbeing," Karina Nielsen, PhD, Sheffield University Management School (Sheffield, UK).

September 28, 2018: “UK Workers – Healthy?”, Dame Carol Black, DBE, FRCP, FMedSci, principal, Newnham College, Cambridge University, and expert advisor on health and work to NHS England and Public Health England.

C.2. Website(s) or other Internet site(s) – include URL(s)

Our Center created a website (<http://centerforworkhealth.sph.harvard.edu/>) as part of our overall Center communication and outreach strategy. During this reporting period, we continued to create and post outreach materials relatable to both academics and practicing professionals including our Center-generated “Implementing an Integrated Approach: Weaving Worker Health, Safety, and Well-being into the Fabric of Your Organization”, our “Workplace Integrated Safety and Health (WISH) Assessment, Policy Implication Summary Sheets related to our work in healthcare and construction, and Case Studies which aim to provide concise summaries of our work illustrating organizational change implemented using a Total Worker Health® integrated approach. We created a website page dedicated to providing resources for implementing organizational projections for front-line workers from the spread of the COVID-19 virus. Our website also lists Center and our affiliated project publications with links to abstracts, upcoming Center events such as presentations and seminars, as well as recordings of Center seminars and webinars. The website links to other TWH® resources including NIOSH and the other NIOSH funded Centers of Excellence for Total Worker Health® for organizations interested in implementing integrated approaches to promote and protect worker health, safety and well-being. The website also described our three research projects and affiliated project. From 2016 – 2021, the Center had 30,000+ website visits, 1,500+ downloads of our Implementation Guidelines, and 500+ downloads of our Workplace Integrated Safety and Health (WISH) Assessment.

The Center also developed a strategic social media presence including an active Twitter account ([#HSPHCenterWork](#)) with 500+ followers. We also created a LinkedIn page that we continually expanded to include information of interest to scholars, researchers, former, and current students and affiliates. We also closely aligned our Twitter account and website postings with the social media efforts of the NIOSH TWH® Program included the other NIOSH funded Centers of Excellence for Total Worker Health®.

C.3. Technologies or techniques

Category	Explanation
Educational Aids or Curricula	The Center launched “Implementing an Integrated Approach: Weaving Worker Health, Safety, and Well-being into the Fabric of Your Organization”. The Guide shows organizations how to implement an integrated approach to worker safety, health, and well-being. The Implementation Guide, its accompanying Tools & Resources, and Executive Summary were made download accessible through the Harvard Center website: https://centerforworkhealth.sph.harvard.edu/resources/guidelines-implementing-integrated-approach .
Educational aids or curricula	The Center developed six Policy Implication Summary Sheets related to our work in health care and construction. They provide summaries of our research using non-academic language and were posted to our Website https://centerforworkhealth.sph.harvard.edu/practice-policy
Educational aids or curricula	The Massive Open Online Course (MOOC): Improving Your Business Through a Culture of Health developed for leaders of small to midsize organizations showed how a “Culture of Health” can transform businesses, improving employee well-being while increasing revenue. Center Director Glorian Sorensen co-led one of the sessions, presenting on the protection and promotion of employee health, safety, and well-being. The previously recorded MOOC was made available on the

	HarvardX website with links from the Center website. https://centerforworkhealth.sph.harvard.edu/education-training/massive-open-online-course-improving-your-business-through-culture-health
Educational aids or curricula	To engage a wider audience in learning about Total Worker Health® and an integrated approach, Center researchers periodically offered seminars and webinars. Seminars and webinars were presented live with recordings made available online through our website after the event. https://centerforworkhealth.sph.harvard.edu/education-training/recordings-center-webinars
Educational Aids or Curricula	The Intervention Effectiveness study developed several new toolbox talks responding to needs assessments and partner priorities. These needs include the high rate of opioid overdoses among construction workers as part of our health education topics including our tool-box talk library including opioid crisis response, Soft-Tissue Injury Prevention, Food & Activity, Tobacco Cessation, Safety Climate, Stress Management, Shift Management, and Communications.
Educational Aids or Curricula	In response to the COVID-19 pandemic, we developed a website page dedicated to resources for organizations employing front-line workers focused on organizational approaches to increase worker protections from the COVID-19 virus. https://centerforworkhealth.sph.harvard.edu/covid19
Educational Aids or Curricula	The Center's research identified and explored best practices, which are the foundation for policies, programs, and practices implemented by organizations seeking to improve worker health, safety, and well-being. We created a website page for posting case studies developed from our work to provide concise summaries of organizational change implemented using a Total Worker Health® integrated approach, https://centerforworkhealth.sph.harvard.edu/practice-policy/case-studies
Survey Instruments	The Workplace Integrated Safety and Health (WISH) Assessment utilized in the Enterprise Outcome study, measures workplace policies, programs, and practices that focus on working conditions and organizational facilitators of worker safety, health, and well-being. The tool can be used by employers and researchers to assess the extent of implementation of an integrated approach. The WISH Assessment was made downloadable through the Center's website https://centerforworkhealth.sph.harvard.edu/resources/workplace-integrated-safety-and-health-wish-assessment
Survey Instruments	The Enterprise Outcomes study developed a new survey tool to evaluate naturally occurring implementation of Total Worker Health approach in the policies, practices, and programs at worksites. Previously, our Center developed the indicators of integration survey tool for these purposes. we saw a need for improved measures as NIOSH and the field have advanced in the definition of what it means for employers to enact Total Worker Health as a way of protecting and promoting workers' health. Similar to steps used previously, we started with examination of the occupational health and public health literature, and then engaged experts within and outside our Center to arrive at candidate questions for the survey. The new survey instrument incorporated the Workplace Integrated Safety and Health (WISH) Assessment and additionally includes questions on features of occupational health programs at

	<p>worksites and will be made available on our website. (Validation of the Workplace Integrated Safety and Health (WISH) assessment in a sample of nursing homes using Item Response Theory (IRT) methods. López Gómez MA, Gundersen DA, Boden LI, Sorensen G, Katz JN, Collins JE, Wagner G, Vrinotis MG, Williams JA. BMJ Open. 2021 Jun 18;11(6):e045656. doi: 10.1136/bmjopen-2020-045656. PMID: 34145013.)</p>
Survey Instruments	<p>The Examining Pathways study also developed multiple outcome and exposure assessment tools with our database data: measures of team consistency, measures of post-injury return-to-work, and unit-level measures of work organizational factors and psychosocial workplace characteristics. We also developed multiple outcome and exposure assessment tools with our database data: measures of team consistency, measures of post-injury return-to-work, and unit-level measures of work organizational factors and psychosocial workplace characteristics. As part of the 2018 Patient Care Worker Survey, we developed a new measure of work-related wellbeing. The work-related wellbeing scale was published so that it can be used by other teams. (Peters SE, Sorensen G, Katz JN, Gundersen DA, Wagner GR. Thriving from Work: Conceptualization and Measurement. International Journal of Environmental Research and Public Health. 2021 Jan;18(13):7196. doi.org/10.3390/ijerph18137196)</p>
Data Bases	<p>The database developed in the Examining Pathways study in collaboration with Mass General Brigham (MGB) is a powerful tool for understanding occupational health challenges and solutions in a resource-efficient manner. We created several products as part of our work on this study. The database itself is a unique product that is a powerful tool for understanding occupational health challenges and solutions in a resource-efficient manner. We also developed multiple outcome and exposure assessment tools with our database data: measures of team consistency, measures of post-injury return-to-work, and unit-level measures of work organizational factors and psychosocial workplace characteristics.</p>

C.4. Inventions, patent applications, and/or licenses

None

C.5. Other products and resource sharing

Category	Explanation
Other	<p>Resource Sharing: We shared the data collected through the Center's research with the community of scientists by making presentations at national conferences and through publications in the scientific literature. We also partnered with worker and industry advocates to present our study designs and findings to audiences outside academia. We also made de-identified data available for secondary analysis to qualified researchers (including students if they met the requirements as set forth by the Harvard T.H. Chan School of Public Health) and our other relevant collaborating institutions.</p>

Educational tools and resources, surveys, and other Center products are available through the Center's website: <http://centerforworkhealth.sph.harvard.edu/>.

D. PARTICIPANTS

D.1 WHAT INDIVIDUALS HAVE WORKED ON THE PROJECT?

Commons ID	S / K	Name	Degree(s)	Role	Cal	Aca	Sum	Foreign Org	Component(s)	Country	SS
GSORENSE N01	Y	Sorensen, Glorian C	BA, MPH, PHD	PD/PI	2.05	0.0	0.0		Admin Core-6436 (Planning and Evaluation Core), Core-6440 (Outreach Core), Project-6437 (Examining Pathways)		NA
	N	Gallagher, Erin		Student Research Assistant	12.0	0.0	0.0		Project-6438 (Intervention Effectiveness)		NA
	N	Huynh, Whitney		Non-Student Research Assistant	9.0	0.0	0.0		Project-6438 (Intervention Effectiveness)		NA
ENAGLER1	Y	Nagler, Eve M		Co-Investigator	2.0	0.0	0.0		Core-6440 (Outreach Core)		NA
GRWAGNER	N	Wagner, Gregory		Co-Investigator	0.54	0.0	0.0		Admin Core-6436 (Planning and Evaluation Core)		NA
JARW1121	Y	Williams, Jessica Allia Rice	MA, BA, PHD	Co-Investigator	0.8	0.0	0.0		Admin Core-6436 (Planning and Evaluation Core),		NA

									Project-6437 (Examining Pathways) Project-6439 (Enterprise Outcome)		
KHOPCIA	Y	Hopcia ,Karen	MS,SCD	Co-Investigat or	1.0	0.0	0.0		Project-6437 (Examining Pathways)		NA
	N	Peters, Susan		Research Associate	7.7	0.0	0.0		Admin Core-6436 (Planningand Evaluation Core)		NA
	N	Lovejo y,Meg		Research Associate	2.4	0.0	0.0		Admin Core-6436 (Planningand Evaluation Core)		NA
	N	Benson - Whalen , Linnea		Program Administrat or	5.0	0.0	0.0		Admin Core-6436 (Planningand Evaluation Core), Core-6440 (Outreac h Core)		NA
	N	Burke, Lisa		Director of Reseach & Outreach	2.0	0.0	0.0		Core-6440 (Outreac h Core)		NA
	N	Dashi, Mario		Program Director	1.0	0.0	0.0		Project-6437 (Examining Pathways)		NA
	N	Karapanos, Melissa		Social Media Coordinator	3.0	0.0	0.0		Core-6440 (Outreach Core)		NA
	N	Kolbin,Rachel		Truven Programmer	1.0	0.0	0.0		Project-6437 (Examining Pathways)		NA
	N	Orechia,Terry		Programmer	3.0	0.0	0.0		Project-6437 (Examining Pathways)		NA
	N	Wallace, Lorraine		Managing Director	4.2	0.0	0.0		Admin Core-6436		NA

									(Planning and Evaluation Core), Core-6440 (Outreach Core)		
	N	Wang, NA		Statistical Programmer	1.0	0.0	0.0		Project-6437 (Examining Pathways)		NA
DMHASHIMOTO	Y	Hashimoto, Dean	MD, JD, MOH	PI	1.0	0.0	0.0		Project-6437 (Examining Pathways)		NA
ESABBATH	Y	Sabbath, Erika Lehr	SCD	Co-Investigator , planning & Plof exam. Path	0.0	1.5	1.22		Admin Core-6436 (Planning and Evaluation Core), Project-6437 (Examining Pathways)		NA
JDENNERLEIN	Y	Dennerlein, Jack Tigh	PHD,BS, MS,MOT H ,BOTH,D OTH	Ctr Assoc Dir, Pi lx Effectiveness	0.0	0.4	2.5		Admin Core-6436 (Planning and Evaluation Core), Project-6438 (Intervention Effectiveness)		NA
JKATZ1	Y	Katz, Jeffrey Neil	MD,MS,AB	Senior Advisor, Co-Investigator	1.0	0.0	0.0		Project-6438 (Intervention Effectiveness),		NA
JUSTINMANJOURIDES	Y	Manjourides, Justin	PHD,BS	Co-Investigator , lx Effectiveness	0.0	1.0	1.0		Project-6438 (Intervention Effectiveness)		NA
LBODEN@BU.EDU	Y	Boden, Leslie		PD/PI of BUsub	3.0	0.0	0.0		Project-6437 (Examining Pathways)		NA
YORGHOS@BU.EDU	Y	Tripodis, Yorghos		Co-Investigator /B iostatistician	1.0	0.0	0.0		Project-6437 (Examining Pathways)		NA

- a. Level of Effort:
- b. New Senior/Key Personnel:
- c. Changes in Other Support:
- d. New Other Significant Contributors:

E. IMPACT

E.1 - What is the impact on the development of human resources, if applicable?

Not Applicable

E.2 - What is the impact the Public Health Relevance and Impact? The investigator should address how the findings of the project relate beyond the immediate study to improved practices, prevention or intervention techniques, legislation, policy, or use of technology in public health

Our work has changed policy and practice among vanguard employers who set norms for business practice. Although a primary focus of the Center was the creation of scientifically sound new knowledge relevant to improving working conditions that support worker health, safety, and well-being, we were and are committed to doing work that makes a difference in the lives of workers, their families, and their employers. Case examples provide a useful way of “telling the story” of impact. At Mass General Brigham, the state’s largest employer, leadership revised its priorities and related policies and practices in response to *BHWHS* findings. Our research on the relationship of workplace mistreatment and bullying to worker injury and mental health expenditures raised awareness of the prevalence of bullying and its worker health and enterprise consequences, leading to significant changes in organizational priorities and practice. Our studies of occupational health disparities have contributed to a broad and sustained commitment by Mass General Brigham leadership to reduce disparities and increase the applicability of employee health and well-being programs to low-wage workers. This work in turn has increased adoption of TWH®-aligned policies and practices that are a focus in our newly funded *BHWHS* renewal project.

Our intervention effectiveness study created sustained change and resilience in construction companies to address worker safety, health, and well-being. Skanska Civil, a leading construction firm, partnered with the Center in the All the Right Moves Project. The program improved workers’ communication and participation in health and safety onsite and strengthened the worksite’s safety climate. Skanska used the tools provided by the research team as a communication mechanism for workers to speak up about health and safety concerns, and for the company to respond efficiently to these concerns. As a result, they are adapting our tools throughout their Northeast operations.

Through the Outreach Core, our collaboration within HealthPartners also influenced practice, resulting in new approaches to worksite health promotion guided by our Implementation Guidelines and joint translational research projects. HealthPartners’ Worksite Health and Population Well-being Department used the Center’s Implementation Guidelines to create a framework to help their clients link well-being to safety and quality outcomes and create a roadmap to achieve a TWH® approach, bridging the gap between their clients’ champions, Human Resources, and Operations. As a result of our pilot work, HealthPartners was able to facilitate the creation of integrated safety and well-being programs and demonstrate its impact with client companies. For the clients participating in the pilot, the TWH® approach created value by improving employee well-being and HealthPartners’ clients could see the impact on core metrics. For HealthPartners staff, it ignited new inspiration for their work, provided career growth opportunities, and improved their consulting with clients.

F. CHANGES**F.1 – Changes in approach and reasons for change, including changes that have a significant impact on expenditures**

Not applicable

F.2 - Actual or anticipated challenges or delays and actions or plans to resolve them

Not applicable

F.3 - Significant changes to human subjects, vertebrate animals, biohazards, and/or select agents

Not applicable

G. Special Reporting Requirements**G.1 Special Notice of Award Terms and Funding Opportunities Announcement Reporting Requirements**

Not applicable

G.2 Responsible Conduct of Research

Not applicable

G.3 Mentor's Research Report or Sponsor Comments

Not applicable

G.4 Human Subjects:

G.4.a Does the project involve human subjects?

Yes

G.4.b Inclusion Enrollment Data

Cumulative Inclusion Enrollment Report

This report format should NOT be used for collecting data from study participants.

Study Title: Hospital Work Organization: Assessing Health Impact with a Longitudinal Database (Examining Pathways)

Comments:

Racial Categories	Ethnic Categories									Total
	Not Hispanic or Latino			Hispanic or Latino			Unknown/Not Reported Ethnicity			
	Female	Male	Unknown/ Not Reported	Female	Male	Unknown/ Not Reported	Female	Male	Unknown/ Not Reported	
American Indian/ Alaska Native	28	1		6						35
Asian	777	163		30	12					982
Native Hawaiian or Other Pacific Islander	25	7								32
Black or African American	2,878	540		132	46					3,596
White	13,026	1,606		1,090	278					16,000
More Than One Race										0
Unknown or Not Reported	61	9		22	8					100
Total	16,795	2,326	0	1,280	344	0	0	0	0	20,745

Cumulative Inclusion Enrollment Report

This report format should NOT be used for collecting data from study participants.

Study Title: Integrated Approaches to Health and Safety in a Dynamic Construction Work Environment (Intervention Effectiveness)

Comments:

Racial Categories	Ethnic Categories									Total
	Not Hispanic or Latino			Hispanic or Latino			Unknown/Not Reported Ethnicity			
	Female	Male	Unknown/ Not Reported	Female	Male	Unknown/ Not Reported	Female	Male	Unknown/ Not Reported	
American Indian/ Alaska Native	0	1	0	0	0	0	0	0	0	1
Asian	0	0	0	0	0	0	0	0	0	0
Native Hawaiian or Other Pacific Islander	0	0	0	0	0	0	0	0	0	0
Black or African American	1	5	0	0	2	0	0	0	0	8
White	5	76	1	0	8	1	0	2	0	93
More Than One Race	0	0	0	0	2	0	0	0	0	2
Unknown or Not Reported	0	1	0	1	10	1	0	2	1	16
Total	6	83	1	1	22	2	0	4	1	120

Cumulative Inclusion Enrollment Report

This report format should NOT be used for collecting data from study participants.

Study Title: Integrated Approaches to Health and Safety in a Dynamic Construction Work Environment (Intervention Effectiveness)

Comments:

Racial Categories	Ethnic Categories									Total
	Not Hispanic or Latino			Hispanic or Latino			Unknown/Not Reported Ethnicity			
	Female	Male	Unknown/ Not Reported	Female	Male	Unknown/ Not Reported	Female	Male	Unknown/ Not Reported	
American Indian/ Alaska Native	0	1	0	0	0	0	0	0	0	1
Asian	0	0	0	0	0	0	0	0	0	0
Native Hawaiian or Other Pacific Islander	0	0	0	0	0	0	0	0	0	0
Black or African American	1	5	0	0	2	0	0	0	0	8
White	5	76	1	0	8	1	0	2	0	93
More Than One Race	0	0	0	0	2	0	0	0	0	2
Unknown or Not Reported	0	1	0	1	10	1	0	2	1	16
Total	6	83	1	1	22	2	0	4	1	120

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G.4.c ClinicalTrials.gov

Does this project include one or more applicable clinical trials that must be registered in ClinicalTrials.gov under FDAAA?

No

G.5 Human Subject Education Requirement

Are there personnel on this project who are newly involved in the design or conduct of human subject's research?

No

G.6 Human Embryonic Stem Cells (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

Not applicable

G.7 Vertebrate Animals

Does this project involve vertebrate animals?

NO

G.8 Project/Performance Sites

Organization Name:	DUNS	Congressional District	Address
Primary: Harvard School of Public Health	149617367	MA-007	677 HUNTINGTON AVENUE BOSTON MA 021156028
University of Kansas Medical Center Research Institute	016060860	KS003	3901 Rainbow Blvd Kansas City KS 661032937
Partners Healthcare	807819615	MA007	99 Revolution Dr Somerville MA 02145
Northeastern University	001423631	MA007	360 Huntington Avenue Boston MA 021555005
Dana Farber Cancer Institute	076580745	MA007	450 Brookline Avenue Boston MA 02215
Boston College	045896339	MA004	140 Commonwealth Avenue Chesnut Hill MA 024673807
Trustees of Boston University	604483045	MA008	881 Commonwealth Avenue Boston MA 022151300

G.9 Foreign Component

Nothing to report

G.10 Estimated Unobligated Balance:

Carryforward request submitted and accepted.

G.10.a Is it anticipated that an estimated unobligated balance (including prior year carryover) will be greater than 25% of the current year's total approved budget? N/A

G.11 Program Income

Is program income anticipated during the next budget period?

Not applicable

G.12 F&A Costs

Is there a change in performance sites that will affect F&A costs?

No

I. OUTCOMES

I. Provide a concise summary of the outcomes or findings of the award, written for the general public in clear and comprehensible language, without including any proprietary, confidential information or trade secrets

Note: project outcome information will be made public in NIH RePORTER

The Center for Work, Health and Well-being at the Harvard T.H. Chan School of Public Health has played a leadership role in the development of the TWH approach since its inception. Critical findings from the Center during the 2016-2021 funding cycle have had a marked impact on the TWH® knowledge base and on reducing the burden of worker illness and injury.

Center investigators created the defining conceptual model for TWH®, included in NIOSH's recent volume on Total Worker Health.® A conceptual model guides research by providing a map of priorities and key research questions. This model places a central focus on the conditions of work, including both physical, such as chemical and physical exposures, as well as organizational conditions of work such as an increasing pace of work and rising job instability, with consequences for psychological distress and increased risk of chronic disease.

Following this conceptual model, Center investigators have conducted research to better understand the central role of working conditions as critical determinants of worker safety, health, and well-being. The *Boston Hospital Worker Health Study*, initiated at the start of the Center's funding in 2007, is a collaboration with Mass General Brigham (MGB, previously Partners Healthcare). Through this study, the Center established a database of approximately 22,000 hospital workers. This model employer database includes human resources data, injury incidence, worker compensation data, and healthcare utilization data matched with employee surveys. Using this dataset, the researchers have documented the relationships of an array of working conditions to workers' health, safety, and well-being, and to employer outcomes, including healthcare costs. These findings have also been used to inform policies and practices in the Mass General Brigham health care system, the largest employer in Massachusetts. A few examples illustrate the impact of this research. First, research about workplace mistreatment and worker injury and research about workplace bullying and mental health expenditures raised leaders' awareness of both prevalence of bullying and its worker health and enterprise consequences. Since the publication of those papers, reducing workplace bullying has become a major strategic priority for the health system. Second, the Center's research about low-wage workers and occupational health disparities has led to a broad and sustained commitment by Mass General Brigham leadership to reduce disparities and increase the applicability of employee health and well-being programs to low-wage workers. Third, the Center's research suggesting associations between working conditions and employee health expenditures has catalyzed greater integration between employee health promotion and occupational health departments within Mass General Brigham. That integration has, in turn, led to the creation of Total Worker Health-aligned policies and practices that the Center's research can analyze.

Research within the Center has also tested the effectiveness of interventions to improve worker safety, health and well-being. During this funding period, the study, *All the Right Moves for Subcontractors*™ developed and tested TWH® interventions in the construction industry, reaching over 12 employers and 600 workers. Starting with the Center's Implementation Guidelines and a focus on improving working conditions, this participatory intervention used the company's communication infrastructure, along with a needs assessment and report, committee-led prioritization, action planning and implementation, and a worker communication/feedback cycle. Although it was not possible to complete the intervention implementation in all study sites due to the COVID-19 shutdown, in the three companies where the program was successfully

completed program, the study observed improvements in safety and health climate, improved worker participation, and higher TWH® implementation, compared to the companies without successful full implementation. With the COVID-19 shutdown, the study converted the intervention program to be implemented and sustained by company personnel, with a focus on COVID-19–related health and safety issues. This sustainable COVID-19–focused program was implemented with construction work crews of a local utility company and subcontractors on a worksite managed by a large national general contractor. The Center is disseminating the tools developed in this study in the renewal of the Center’s work.

The Center has also developed and tested measures of integrated TWH® approaches that advance the TWH® field. The Center’s Workplace Integrated Safety and Health (WISH) Assessment measures workplace policies, programs, and practices that focus on working conditions and organizational facilitators of worker safety, health, and well-being. The tool can be used by employers and researchers to assess the extent of implementation of an integrated approach. This validated measure assesses six core constructs central to best practices for protecting and promoting worker safety, health, and well-being: (a) leadership commitment; (b) participation; (c) policies, programs, and practices that foster supportive working conditions; (d) comprehensive and collaborative strategies; (e) adherence to federal and state regulations and ethical norms; and (f) data-driven change. Available on the Center’s website since 2018, the WISH tool has been downloaded more than 500 times.

This measure was used in the Center’s *Enterprise Outcomes Study*, developed in response to the exceptionally high risk of chronic disease and occupational injury among the 3.5 million workers in the U.S. nursing home industry. The central hypothesis was that nursing homes whose programs, policies, and practices align more closely with TWH®, as measured by our WISH Assessment, would have better outcomes with respect to occupational injury and quality of patient care compared to worksites less aligned with TWH® approaches. The study surveyed 570 nursing homes in California, Massachusetts, and Ohio using the WISH Assessment and assessments of the strength and types of their occupational health and wellness programs. The study merged these survey data with data on each facility’s occupational injury rates, available through a partnership with Workers Compensation bureaus, and with data on quality of care (assessed as patient outcomes on key medical conditions) and nursing homes’ operational, organizational, and patient characteristics, obtained from federally mandated administrative databases. Using this survey sample, we validated the WISH Assessment measure and used the survey data to abbreviate the tool. Ongoing analyses are evaluating (a) the relationship between TWH® as measured by the WISH Assessment and the numbers of COVID-19 cases among residents and staff at nursing homes; (b) the relationship of TWH® implementation to injuries; and (c) the relationships between TWH® implementation and nursing-sensitive quality indicators.

The Center has disseminated and implemented best practices for TWH® interventions. The Center’s Implementation Guidelines, developed in the prior funding cycle, defined our TWH® approach to improving conditions of work. The Guidelines have been downloaded from the Center’s website more than 1500 times. The Guidelines are part of the Center’s Capacity Building Suite, which also includes guidelines for training and technical assistance. The Center’s work has demonstrated that this Capacity Building Suite can be used effectively by third-party providers to guide employers in the use of TWH® approaches. In addition, the Center has placed increasing priority on workplace and public policies as a critical facilitator of change, as evidenced by our publications, presentations at the TWH® international meetings.